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Journal of THE AMERICAN DIETETIC ASSOCIATION

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Beulah D. Westerman et al.

What Do Ye More Than Others?

35th A.D.A. Annual Meeting, Minneapolis, October 21-24, 1952

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VOLUME 28
NUMBER 4

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CONTENTS, APRIL 1952

BETTER FOOD FOR SUBMARINERS. A Subsistence Study—*Lcdr. Lendal H. Kotschevar*, SC-USNR 301

NITROGEN UTILIZATION IN OLDER MEN—*Kate Daum*, Ph.D., *W. W. Tuttle*, Ph.D., *Birdie Warren, Margaret Sabin, C. J. Imig*, Ph.D., *and Mary T. Schumacher* 305

FOOD COMPOSITION TABLES AND ASSESSMENT OF THE CALORIC CONTENT OF DIETS—*Jean Mayer*, Ph.D., D.Sc. 308

AMINO ACID INTAKES AND EXCRETIONS DURING PREGNANCY—*Bernice B. Sheft and Helen Oldham*, Ph.D. 313

ENAMEL EROSIVE PROPERTIES OF FRUITS AND VARIOUS BEVERAGES—*Carey D. Miller* 319

EFFECT OF HOLDING ON BACTERIAL COUNT AND PALATABILITY OF MEAT LOAVES. Before and after Freezing and after Reheating—*Rachel M. Ice, Karla Longrée*, Ph.D., *Faith Fenton*, Ph.D., *and Katharine W. Harris* 325

B-COMPLEX VITAMINS IN MEAT. IV. Influence of Storage Time and Temperature on the Vitamins in Pork Roasts—*Beulah D. Westerman*, Ph.D., *Gladys E. Vail*, Ph.D., *June Kalen, Miriam Stone, and D. L. Mackintosh* 331

CURRENT COMMENT

What Do Ye More Than Others?—*R. Alberta Hughes* 336

BOOK REVIEWS 344

SECOND ANNUAL A.D.A. PHOTOGRAPHIC CONTEST 346

CURRENT LITERATURE 348

NEWS NOTES 362

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Better Food for Submariners

A Subsistence Study[1]

Lcdr. LENDAL H. KOTSCHEVAR, SC USNR-V[2]

FOOD on a submarine must be the best. The prolonged confinement and environmental stress of a long war patrol demand psychologic compensation and health safeguards, and good food is one of the few resources available for maintaining the morale and health of a crew.

The problems of producing good food on a submarine are great, and the Navy has spared no effort in its attempts to overcome the limitations in producing it. As a result, submarines serve the best food in the fleet today, but this is not felt to be sufficient. The increasing importance of submarines in our national defense and the forthcoming advent of the atomic submarine has emphasized the need for even better food. The long hours of the cooks, the lack of space and equipment for food preparation and storage, garbage disposal, and other problems are considerable, and the Navy desires to improve them. This paper reports investigations designed to maintain or improve the quality and nutritive value of the foods served on submarines while at the same time reducing some of the more serious limitations attached to producing it.

PROBLEMS OF COOKING UNDER THE SEA

Cooking under the sea is not an easy task. Because of the limited space, all food required for a long voyage cannot be loaded into the provided storage spaces. It is not unusual to see in a submarine about to sail on a long cruise cases of canned goods placed end to end in the main passageway where they will be walked upon until removed for eating or cans of food piled around torpedoes, under bunks and mattresses, or any other available space. Even the showers, which are seldom used at sea because of the lack of fresh water, are oftentimes crammed full of cases of fresh apples, oranges, and other desirable foods. Frozen meats, vegetables, and fruits can be carried in limited supply. Fresh milk is available for a week, and fresh fruits and vegetables last about twenty days. When these are gone, the crew must eat canned, preserved, or dehydrated foods usually at the very time, in the later stages of the patrol, when they most desire and require fresh foods.

The galley of a submarine is small. There is almost no working space. Only two small ranges, the size of a household range, are provided. The sink is tiny and up against the outside of the boat where the sloping contour overhead makes it difficult to use. There is a 12-qt. mixer, a small deep-fat fryer, and a 2-gal. coffee urn. The few pots and pans on hand are barely enough for cooking. Since storage space is lacking, the cooks store many of their pots and pans in the ovens when they have finished work for the day.

Because water and electricity must be manufactured at sea, their use in cooking must be kept at a minimum. Also, when under the sea, the only air available is that which is in the submarine. Since this must be conditioned and reconditioned over and over again, cooking fumes and excess heat from cooking must be minimized so as not to overburden the air conditioning system.

When on the surface, a submarine is tossed about considerably, and cooking a meal at such times is an ordeal. Pots must be securely locked down, and wet terry toweling is spread on work surfaces to prevent the slipping of containers and spilling of foods. Even the most robust cakes fall, and pies break through their top crusts and spill out into the oven. Deep-fat fryers cannot be used, for hot fat in such a sea is dangerous. A frying egg races madly back and forth across the griddle until captured by the harassed cook for the hungry breakfaster. On a particularly bad roll of the boat, the cook and his pots, pans, and food can be pitched out of the galley, and the meal will end up looking much like a futuristic painting on the side of the bulkhead (wall). As one desperate cook said one day, "I could ski down the steepest mountain juggling three oranges easier than I can cook on this boat today!"

Garbage is also a problem. When the submarine is under water, garbage must be packed into weighted sacks and shot out of torpedo tubes. When the boat is on the surface, garbage must be hauled up in

[1] The views or conclusions contained in this report are those of the author and are not to be construed as necessarily reflecting the views or endorsement of the Department of Defense.

[2] Formerly Head Technologist, U. S. Naval Supply Research and Development Facility, Bayonne, New Jersey.

weighted sacks through the conning tower to the bridge and thrown overboard. No trace of garbage must remain on the surface to give telltale evidence to the enemy of where the submarine is, nor must any garbage be allowed to cling to the sides of the boat where, after a quick dive, it will come off and float, thus providing a fatal marker for the enemy's depth bombs. As yet, garbage disposal grinders are not successful on submarines.

The life of the submariner is not easy.[3] He stands one or two 4-hr. watches a day. At other times he is free, as free as any man can be in a sealed tube 300 ft. long and 25 ft. wide which is filled with a host of other men, torpedoes, and equipment. If the submarine is operating below the surface under battle conditions, all lights must be out except a few which are dimmed. He cannot smoke—that would foul the air; he cannot talk—that would disturb those listening on the delicate underwater phones; he cannot walk about—that would disturb those at work. So he lies in his bunk in the eerie, clammy, dark, silent ship while it stealthily stalks its prey from the depths of the ocean.

Recreation is truly a problem. Movies can be shown for an hour or two a day. At other times the sailor can read, provided lights are not dimmed to save electricity. He can write letters, but he cannot mail them—or, he can play cards—or tell "sea stories." But, such a life is terribly confining to a young man, and small wonder that he grows bored, restive, and subconsciously, even though it is not readily measurable, builds up a resentment against the patrol; his environment; the lack of sunlight and fresh air; the heavy, pitching seas; and the food. He eats not because of a natural appetite brought about by exercise, but because in eating he finds a satiety and emotional satisfaction which shield him from the stress of his environment and the discomforts of the cruise.

Under such conditions, the job of serving good food becomes tremendous. Yet a submarine sailor must have good food; the effectiveness of the submarine and his welfare demand it.

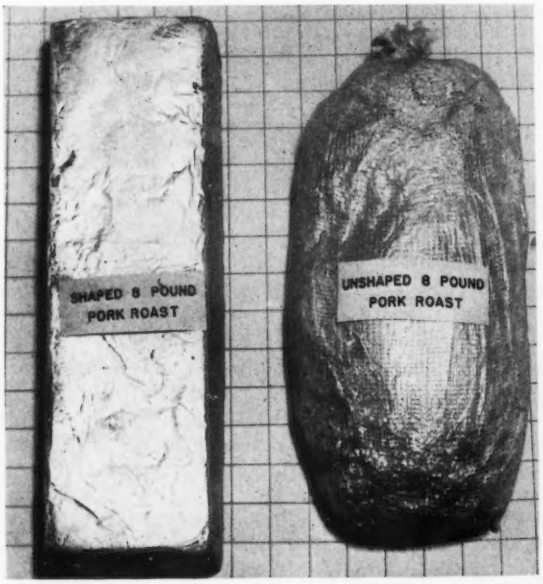
A RESEARCH PROGRAM IS BEGUN

Early in 1949 an extensive research program in submarine subsistence was begun at the Commissary Research Division of the U. S. Naval Supply Research and Development Facility at Bayonne, New Jersey. The purpose of this program was to eliminate or reduce the problems of producing good food on a submarine during a wartime patrol.

At the very outset it was evident that many of these problems came about because the submarines were attempting to do more food preparation at sea than was actually feasible. If foods could be brought on board with much of the preliminary preparation already accomplished, preparation and cooking times, waste, storage space, and a great number of the problems now causing difficulty would be reduced or eliminated. Fortunately, a number of foods were appearing on the market based on this very principle, and manufacturers of such foods were invited to submit their products for testing and evaluation.

These foods were first tested in the Bayonne research galleys. If found acceptable, they were then served to the enlisted men at Bayonne. Passing this test, the foods were then studied on board submarines. As work progressed, data of considerable promise were uncovered. For instance, it was found that by using the bakery premixes, a saving of approximately 25 per cent was effected in the storage space required to carry the raw materials from which the same quantity of similar bakery products could be made. Furthermore, preparation times were shortened and standards, if not raised, were at least made consistent.

Precooked frozen foods were also found to be extremely efficient as timesavers, spacesavers, and in standardizing certain types of foods at high quality levels. Their use saved about 30 per cent in space



Example of food redesigned to save cubage when stored in frozen blocks. Unshaped roast required more space, due to rounded corners—space which was wasted in stacking. Official Navy Photo RDF 565-1.

[3] EDITORS' NOTE: When this paper was cleared for publication by the Department of the Navy, Captain R. S. Benson, Chief of Information, who has been in the submarines most of the time since 1934, commented: "It is worth remembering that, even though life aboard a submarine is tough, the personnel not only do not mind it—they love it and would not swap with duty on any other type of ship. Submarine duty, as you know, is completely volunteer, and was so even under the great expansion during World War II."

and weight. Because industry had not done the required research and was not producing the desired variety of precooked frozen foods packed for large quantity use, the Navy initiated a research program in frozen foods, developing techniques and processes which, by the summer of 1950, were perfected to the point where they could be turned over to industry for use in producing these foods for naval use.

Prefabricated meats were also tested and found efficient. Similarly, new frozen foods, frozen concentrates, concentrates not requiring frozen storage, and dehydrates were tested for adaptability and recipes perfected for their use.

Once a food item was accepted, storage tests were begun. Withdrawals from storage were made at the end of three, six, nine, and twelve months at which time the experimental item was evaluated by comparison with a control item prepared from fresh Navy supplies by Navy cooks.

In this testing many products were eliminated, but gradually the list of acceptable items lengthened. By early winter of 1950, sufficient data and food items were available so that it was possible to assemble an entire provision load which was thought sufficient to last for a long submarine patrol. About one-third of the foods in this load was experimental, the remainder being normally used supplies. Naval authorities were then requested to place this load on board a submarine and to test it at sea under as rigorous conditions as those which would be encountered in a wartime patrol.

On the thirty-first of January, the USS *Toro*, loaded with the experimental provision load and carrying an observer from the facility at Bayonne, sailed for an extended simulated war patrol into the stormy waters above the Arctic Circle. Accompanying the *Toro*, but loaded with normal provisions and acting as a control in the study, was another submarine, the USS *Halfbeak*. During the patrol, data were to be obtained on each boat so that on return to port comparisons could be made as to the efficiency and utility of the experimental load compared with present foods used by the Navy and carried on board the *Halfbeak*.

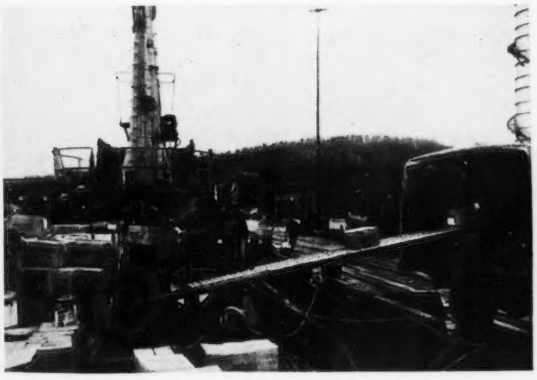
For the patrol, both boats loaded the quantity of provisions considered necessary to permit their stay at sea for maximum endurance periods, and at sailing, one significant difference was already evident. The experimental load on the *Toro* went easily into the provided storage spaces except for about 30 cu. ft. of frozen food which had to be placed in the chilled refrigerated space where, after thawing, it could be used during the first week at sea. In contrast, the *Halfbeak*, loaded for fifteen days less at sea, had had to stow food in the showers, around torpedoes and bunks, and other living spaces.

For forty-nine days the two boats operated under simulated wartime patrol conditions in an area which at that time of the year has probably the most adverse weather and turbulent seas known in the world. Then a fire occurred on the *Halfbeak* causing a cessation of the test and a return to port. While it had been planned to stay at sea considerably longer, the return to port did not materially affect the study. Sufficient data had been obtained to compare the efficiency and acceptability of the two loads.

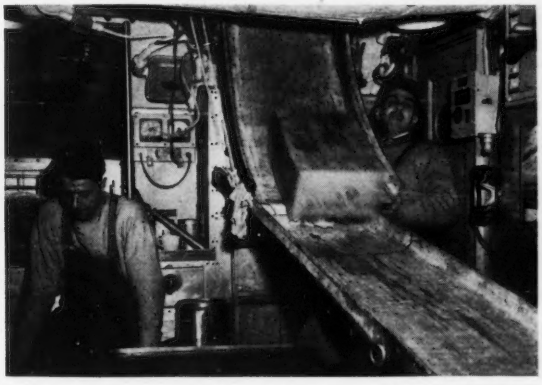
RESULTS

With the return of the two boats to port and tabulation of the data, it was found that many of the experimental foods on the *Toro* were more efficient in their use and more acceptable.

While the *Halfbeak* had practically no fresh meats left and had exhausted or almost exhausted many other essential supplies, even though the return to port had been made ahead of schedule, the *Toro* had ample frozen foods and other supplies on board and could have remained at sea even longer than had been planned. The quantity of food consumed on the *Toro* was 4.1 lb. or 0.124 cu. ft. per man per day in comparison with 5 lb. or 0.149 cu. ft. per man per day on the *Halfbeak*.



Unloading supplies and provisions from truck to deck of Toro, *prior to loading inside the ship.* Official Navy Photo RDF 565-6.



Experimental provisions being dropped into the Toro *down an improvised chute using an escape hatch.* Official Navy Photo RDF 565-18.

Garbage was reduced on the *Toro* by approximately 65 per cent; this was considered very significant in view of the fact that with increased underwater travel by the new snorkel submarine and the forthcoming atomic submarine, garbage disposal will be a serious problem.

The cooks and scullery workers on the *Toro* worked a total of about 25 per cent less hours than did those on the *Halfbeak*. Yet, the food standards and the variety of the food served on the *Toro* were far higher. The *Toro* cooks, not pressed for time, were quite willing to spend more time in doing little extra things which made their foods better and pleased the crew. Thus, the *Toro* had more elaborate desserts than are usual on such a patrol, such as cherry crumb pie, cream puffs, and baked Alaska.

The premixed bakery products on the *Toro* were also very efficient. Operating conditions permitting, baking was done at night on both boats, but the *Toro* had far more satisfactory results. By using the specially developed bread mix adapted to a "no-time" bread dough technique for submarine use, the *Toro* in one shift could bake all the bread required for a day or several days and all the other required desserts on the menu. For instance, it was possible for one baker in the two small ovens to bake 28 lb. bread, 12 lb. corn bread, 14 lb. sweetdough, breakfast rolls, and 85 servings of shortcake in one shift. In a test made to ascertain the maximum amount of bread which could be produced from the premixed bread product using the "no-time" technique, one baker in 9 hrs. baked 48 2-lb.-6-oz. loaves of bread and 10 pie shells. Thus, on the *Toro* it was not only possible to have a variety and sufficiency of bakery goods, but it was possible to keep supplies on hand so that when conditions prevented baking, bread and bakery goods were still available.

On the other hand, the *Halfbeak*, operating under the adverse conditions and pressed for time to get even the basic meal on the table, was forced to serve canned fruits much of the time for desserts. They had few pies and cakes during the patrol, and at no time had such items as sweet rolls and other special bakery goods for breakfast. In fact, during a period of three days, the *Halfbeak* was out of bread because operating conditions prevented baking.

The precooked frozen foods on the *Toro* were extremely efficient, especially during periods of prolonged submersion, in producing meals which were quick to prepare, appetizing, and hot. Since submarines oftentimes during submersion have only hot soup and sandwiches at mealtime, waiting for a hot meal until they surface and have plenty of fresh air in the boat and electricity with which to cook, this use of the precooked frozen foods was especially well adapted to such conditions.

The quantities of electrical energy and water used on board the *Toro* for cooking were also reduced by using the experimental foods.

One of the surprises of the study appeared in some of the acceptability ratings given some of the experimental foods in comparison with those given by the panels on shore. For about three weeks, the acceptability levels of the foods followed closely those of the shore panels. Then, a number of foods began to decline in acceptability. At a certain point, some leveled off, but others continued to decline until they were highly disliked by the crew and the men refused to eat them. One of these was a new dehydrated potato product, of which it was said by one member of the crew, "Plastic houses, plastic duds! Now I've seen them, plastic spuds!"

Another surprise of the study was that the cost of food per man per day on the *Toro* was just slightly under that of the *Halfbeak*. This had not been expected. Because of their experimental nature, certain foods which were put on the *Toro* were expected to raise the cost above that of normal provisions. It was thought that while the cost per pound of some of the experimental foods might have been high, the fact that these foods gave a much higher net yield as served than regular foods reduced the ultimate cost.

NUTRITIVE VALUES

In this study an attempt was made to divide all food wastes and spoilage into distinct food classifications and to record the weights. These quantities were then used for correcting quantities of foods calculated as consumed on both boats during the study. Furthermore, all private foods, such as candy, cookies, canned goods, and other items, taken on board by the men were inventoried and included as food consumed. On the basis of the data obtained, the average submariner on the patrol on either boat consumed approximately 3800 calories per day. The diet further provided an average daily intake of 3 mg. thiamine, 2.5 mg. riboflavin, 35 mg. niacin, 100 mg. ascorbic acid, and 7400 I. U. vitamin A. The protein-carbohydrate-fat ratio was 1:4:1. In no instance did the separate calculations for both boats vary significantly from these mean calculations. The mean weight increase of the men on the *Halfbeak* was $\frac{1}{2}$ lb. in contrast to a mean weight loss of $1\frac{1}{2}$ lb. on the *Toro*, the difference in weight not being considered as statistically significant.

The *Toro-Halfbeak* study completed the first phase of a series of investigations planned so that the best food possible may be served to submarine crews. Further investigations are already underway. Within the next few years, submarine feeding may undergo revolutionary changes. Food preparation may be made easier and food standards higher. Foods will have more interest to the crew, because better foods will be available over the entire period of a long cruise. The health and morale of the men should be raised and, as a result, our submarines should be better weapons of national defense.

Nitrogen Utilization in Older Men[1]

KATE DAUM, Ph.D., W. W. TUTTLE, Ph.D., BIRDIE WARREN, MARGARET SABIN, C. J. IMIG, Ph.D.. and MARY T. SCHUMACHER

Departments of Nutrition and Physiology, College of Medicine, State University of Iowa, Iowa City

IN THE course of the experiment dealing with certain physiologic responses of a group of older men on a controlled diet in which the types of breakfasts varied (1, 2), data were collected on the utilization of nitrogen, fat, calcium, phosphorus, iron, thiamine, and niacin. This paper reports the data on nitrogen.

The subjects were seven men ranging in age from fifty-three to eighty-three years. Physical examination did not show the presence of any disability to any degree. All were active, four being regularly employed with full-time jobs, one with part-time work, and two were retired. Cooperation of the subjects was excellent, as it meant not only good meals but attention and social contacts. In addition, it was of some economic importance to most of the subjects. After the first two weeks, complaints about lack of appetite, gastric discomfort, and likes and dislikes disappeared.

Procedures followed in this study were similar to those reported previously where young men were subjects (3, 4). After a period on a self-chosen diet in the hospital cafeteria, the subjects consumed weighed diets for nine months. During this time four breakfast situations were created: basic cereal-and-milk; basic bacon-egg-and-milk; heavy breakfast; and "no breakfast."

The basic cereal-and-milk and the bacon-egg-and-milk breakfasts furnished one-fourth of the total calories and protein, while the heavy breakfast furnished two-fifths or 40 per cent. "No breakfast" meant that the subjects ate nothing between 6 p.m. and noon the following day. Each breakfast period was followed by a "no breakfast" period. The weighed diets were based on the foods chosen in the hospital cafeteria and these in particular determined the protein level.

Caloric intakes were adjusted after the preliminary period so that body weights of most of the subjects remained relatively constant throughout the study.

In Table 1 are given data relative to protein and caloric intakes and weight changes. The total caloric and protein intakes were very similar to those of the group of young men reported earlier (4).

Urine and fecal collections were made during the last week of each period, and nitrogen, creatine,

TABLE 1

Description of the subjects and the dietary intakes

SUBJECT	ACTIVITY AND OCCUPATION	AGE	INITIAL WEIGHT	FINAL WEIGHT	DAILY AVERAGE PROTEIN INTAKE		DAILY AVERAGE CALORIC INTAKE	CALORIES PER KILOGRAM
		yr.	*lb.*	*lb.*	*gm.*	*gm./kg.*		
B. B.	Active—part-time employment	78	166	154*	80.6	1.2	1788	26
H. G.	Active—unemployed	83	153	169†	92.1	1.4	2629	34
J. M.	Active—retired farmer	75	221	206*	129.9	1.6	3746	40
P. N.	Very active—carpenter	62	185	188	125.3	1.4	3610	41
J. R.	Active—housekeeping employee	65	165	163	99.6	1.4	2809	38
E. S.	Active—laboratory assistant	53	170	174	95.5	1.3	2823	35
N. S.	Active—laboratory assistant	59	137	151‡	113.9	1.4	3398	49

* Weight change at beginning of experiment.
† Gradual change which the patient desired.
‡ Gain in last three months of experiment.

[1] This work was generously supported by a research grant from the Cereal Institute, Inc., Chicago. Received for publication February 1, 1952.

TABLE 2

Average daily excretion of creatinine and creatine

SUBJECT	WEIGHT	AVERAGE URINARY CREATININE	CREATININE COEFFICIENT	AVERAGE URINARY CREATINE	CREATINE RETENTION*
	kg.	*gm.*	*mg./kg.*	*gm.*	%
B. B.	70.8	1.12	15.7	0.136	88.4
H. G.	76.9	1.20	15.5	0.146	93.0
J. M.	92.3	1.84	19.8	0.166	90.7
P. N.	85.2	1.80	21.1	0.127	88.4
J. R.	74.1	1.35	18.2	0.125	87.2
E. S.	67.2	1.42	21.0	0.156	91.8
N. S.	78.8	1.35	17.1	0.105	94.2
Mean.....					90.5

* Following a test dose of creatine.

and creatinine determinations were made using standard methods of analyses (5, 6).

Creatinine determination was used as an index of complete urine collections, and the creatinine coefficient was calculated since some change in muscle and in muscle strength is recognized as a part of the aging process.

Table 2 gives the average creatinine values, the creatine excretion, creatinine coefficient, and the per cent of creatine absorption following the ingestion of a test dose of creatine. Two of the subjects showed a creatinine coefficient slightly below the range usually quoted (5).

All the subjects excreted creatine. Albanese and Wangerin (7) reported a small but almost daily excretion in their subjects, although text books still state that it is not a daily constituent of male urine.

The average retention of ingested creatine on a creatine-free diet following the creatine tolerance test procedure of Milhorat and Wolff (8) averaged 90 per cent with a range from 87 to 94. Normal retention varies from 70 to 100 per cent.

Nitrogen intake and output during the various periods are given in Tables 3 and 4.

Subject B. B., who had the lowest caloric intake, was in negative balance in two of the four periods. Subject P. N., the most active of the group, also had difficulty maintaining a positive balance. The other subjects showed ability to store protein. Mitchell (9) reported nitrogen storage in adults on liberal diets. Roberts *et al.* (10), Kountz and coworkers (11, 12), and Pyke *et al.* (13) studied protein requirements in older subjects. Pyke and Roberts found that 0.7 to 0.8 gm. per kilogram were required for equilibrium. Kountz concluded that larger intakes, such as 1.4 or 1.6 gm., were necessary. He, however, had marked weight loss in some subjects and marked nitrogen loss in the stools of some subjects. He used a caloric intake of 1800 to 2000 calories for his institutionalized group.

In the last experimental period (the heavy breakfast regimen reported in Table 3) where additional protein was added to B. B.'s diet and additional calories to P. N.'s diet, both subjects established positive balances. E. S. gained 12 lb. during this period, although no change was made in his intake.

There was little difference between the adjustment

TABLE 3

Average daily nitrogen excretion during four breakfast periods

SUBJECT	NITROGEN INTAKE	NITROGEN OUTPUT		NITROGEN BALANCE
		Urinary	Fecal	
Basic Bacon-Egg-and-Milk Breakfast				
	gm.	*gm.*	*gm.*	*gm.*
B. B.	12.9	12.2	0.9	−0.2
H. G.	15.4	13.1	1.5	0.8
J. M.	20.2	18.3	1.5	0.4
P. N.	18.7	18.7	1.7	−1.7
J. R.	15.9	14.4	1.4	0.1
E. S.	15.1	13.4	1.1	0.6
N. S.	17.4	14.8	2.6	0.0
Average.....	16.5	15.0	1.5	0.0
Standard deviation.....				0.50
Basic Cereal-and-Milk Breakfast				
B. B.	12.6	12.6	0.6	−0.6
H. G.	14.6	12.6	1.1	0.9
J. M.	20.8	18.0	1.4	1.4
P. N.	21.7	18.5	1.7	1.5
J. R.	15.8	12.3	1.0	2.5
E. S.	15.4	11.5	1.6	2.3
N. S.	19.9	15.5	1.5	2.9
Average.....	17.3	14.4	1.3	1.6
Standard deviation.....				1.13
No Breakfast				
B. B.	13.4	12.3	1.0	0.1
H. G.	15.4	12.7	1.2	1.5
J. M.	21.0	19.7	1.7	−0.4
P. N.	21.2	19.6	1.5	0.1
J. R.	16.1	14.9	1.4	−0.2
E. S.	15.5	11.5	1.3	2.7
N. S.	18.4	16.2	1.5	0.7
Average.....	17.2	15.3	1.4	0.6
Standard deviation.....				1.08
Heavy Breakfast				
B. B.*	15.3	13.9	0.8	0.6
H. G.	15.3	13.6	1.1	0.6
J. M.	19.4	16.7	1.8	0.9
P. N.†	16.1	13.4	2.0	0.7
J. R.	15.9	13.6	1.2	1.1
E. S.	15.9	12.0	2.0	1.9
Average.....	16.3	13.9	1.5	1.0
Standard deviation.....				0.45

* Protein intake increased to 1.4 gm. per kilogram.

† Caloric intake increased to 4000.

TABLE 4

Summary of average nitrogen excretion during sampling period for each subject during a nine-month period on a controlled diet

SUBJECT	NITROGEN		BALANCE
	Intake	Output	
	gm.	*gm.*	*gm.*
B. B.	13.6	13.6	0.0
H. G.	15.0	14.2	0.8
J. M.	20.4	19.8	0.6
P. N.	19.5	19.2	0.3
J. R.	15.9	15.0	0.9
E. S.	15.5	14.1	1.4
N. S.	18.6	17.4	1.2

of these men to the types of breakfasts and to the period in which no breakfast was eaten. The retention values were higher during the cereal-and-milk breakfast regimen, and all were in balance during the heavy breakfast period (Table 3).

The fecal nitrogen figures for all periods are given in Table 3. No relation between intake and output was evident. The variation among the individual subjects is evident. Toscani and Whedon (14) in a recent report pointed out this variability. Three subjects showed high values in three periods. The stools were bulky and sour smelling but showed no gross food particles, and there were no complaints relative to the lower bowel. Complaints about constipation occurred occasionally and were handled easily by adding prunes or raw apples to the evening meal.

SUMMARY

Data concerning nitrogen utilization of seven men varying in age from fifty-three to eighty-three years were collected during a nine-month dietary regimen in which the types of breakfasts varied.

Creatinine coefficients were normal except for two subjects. Creatine was excreted by all subjects. The response to the creatine tolerance test was normal.

Nitrogen intake varied from 1.2 to 1.6 gm. per kilogram. Five of the seven subjects established equilibrium or storage in the first three periods. Slight changes in protein intake or calories established satisfactory balances in subjects who were in negative nitrogen balance in the earlier periods.

High fecal nitrogen was observed in three subjects during three different periods, but this did not markedly affect the nitrogen balance.

The average daily retention in this group of older men was slightly lower than in a group of young men during a similar regimen (2).

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Vitamin B_{12} in Milk

Results from seven experiments by the Bureau of Dairy Industry show that average raw milk contains the equivalent of about 5 mcg. vitamin B_{12} per liter. Drying and storage of raw milk cause no destruction of vitamin B_{12} activity, nor does pasteurization. In fact, the potency of pasteurized milk tended to be slightly greater than that of the raw milk.

Investigations of the effect of vitamin B_{12} on rats last year indicated the importance of the vitamin in reproduction, lactation, and the rearing of young rats. Diets deficient in vitamin B_{12} produced the following results: birth weight was decreased; early infant mortality was high; secretion of milk apparently was reduced; growth rate and development of surviving young after weaning was subnormal; and attainment of sexual maturity was delayed. These conditions did not occur when vitamin B_{12} was included in the rats' diet.—*Excerpted from the Report of the Chief of the Bureau of Dairy Industry, 1951.*

Food Composition Tables and Assessment of the Caloric Content of Diets[1]

JEAN MAYER, Ph.D., D.Sc.

Department of Nutrition, Harvard School of Public Health, Boston

HISTORICALLY, the problem of determining caloric content of human diets has been of fundamental significance, not only as the basis of our knowledge of nutrition, but also in the history of science generally. The modern eras of chemistry and biochemistry are generally considered to have as their common origin the introduction by Lavoisier around 1770 of the use of the balance and the thermometer in clinical and biologic studies. His experiments, performed on animal and human subjects, led to the principle of the equivalence of combustions of foodstuffs and respiration, which is basic to the problem of "fuel value" of foods. He showed that both combustion and respiration represented combinations with the oxygen of the air, resulting in the formation of "fixed air" (carbon dioxide) and water and producing heat measurable by its effect on the temperature of a certain mass of water.

In the second half of the nineteenth century, the Munich school of physiologists, under the leadership of Voit and Rubner, showed that if calorimetric studies were performed with sufficient care, the caloric content of ingested food minus the caloric equivalent of the urine and feces was strictly equal to the heat and work produced by the subject. This was taken as proof that the principle of conservation of energy could be applied to life, and to man in particular, and established the fact that there was no mysterious "Maxwell's demon" or "vitalist force" at work in living organisms which would prevent the application of chemical thermodynamics of physical chemistry to physiology, nutrition, or medicine.

On this side of the Atlantic, the unparalleled development of nutritional research in the United States started when Atwater, a student of Voit, returned to America in 1873 to embark on a comprehensive study of the fuel value of all important food in American dietaries. As this work is still the basis of present-day food composition tables, it may be useful to recall briefly the salient points of Atwater's method as he developed it in his comprehensive report published in 1900 (1). For a comprehensive review of the Atwater system, the reader is invited to turn to the excellent study of Maynard (2).

[1] Presented at the 34th Annual Meeting of The American Dietetic Association in Cleveland, on October 11, 1951.

THE ATWATER SYSTEM

Atwater began his work summarizing 185 dietary studies of various groups of people in various areas in the United States. The foods concerned were classified in groups (meats, milk, cereals, sugar, vegetables, fruits, and so on). The percentage of protein, fat, and carbohydrate contributed by each food group was calculated, and results were assayed. The distribution of nutrients corresponding to the "average diet" could thus be established. It must be noted that while Atwater measured the water, fat, protein, and ash content of foods directly, the carbohydrate content was determined "by difference"—the difference between initial weight and the sum of water, fat, protein, and ash. Protein, incidentally, was obtained by multiplying the nitrogen content by the factor 6.25, corresponding to a proportion of 16 per cent of the proteins represented by nitrogen.

Atwater next compiled the heats of combustion of proteins, fats, and carbohydrates representative of each food group. Then, on the basis of his dietary studies, he calculated the average heat of combustion corresponding to protein, fat, and carbohydrate for each group. The figures for protein were decreased by 1.25 calories per gram—the heat of combustion of the urea formed from 1 gm. protein—a figure which had been obtained as an average of forty-six determinations on the urine of men consuming mixed diets. For each group, the heats of combustion (minus 1.25 calories per gram for proteins) were then multiplied by the digestibility coefficient. To each food group "specific" fuel values for its fat, protein, and carbohydrate could thus be ascribed. For example, the fuel values of the proteins of eggs, meats, cereals, legumes, fruits, and vegetables were 4.35, 4.25, 3.70, 3.20, 3.15, and 2.90 calories per gram respectively. The range of variation was somewhat less for fat (9.00 to 8.35 calories

per gram for meat and vegetable fats respectively) and for carbohydrates (4.10 to 3.60 calories per gram for cereals and fruits).

Atwater also found that when a "normal" American diet was considered and the fuel values of protein, fat, and carbohydrate averaged for a "normal" distribution of food groups, the averages *for the whole diet* were 4.00, 8.90, and 4.00 calories per gram respectively or, according to the well-known approximation, 4, 9, 4. During the half century which followed Atwater's work, the principles and detailed results of his studies were often forgotten with the exception of the 4, 9, 4 values, and few coefficients have been so universally used—and, not infrequently, abused.

AVAILABLE CARBOHYDRATES

The application of the 4, 9, 4 figures to *individual* foodstuffs was, of necessity, inaccurate. In some cases the errors thus entailed could be of considerable importance. Furthermore, even when the correct Atwater figures were employed, certain foodstuffs might fall outside of the list of those he had studied, and it would, therefore, appear necessary to go through the long and costly processes of calorimetric determinations and digestibility experiments to get the "specific" fuel values to be applied. While the situation regarding proteins and fats, highly digestible material as a rule (the indigestible fraction, like the proteins of teguments, is usually removed from food at the "retail" level), was fairly clear-cut, carbohydrates proved a special problem. The carbohydrates obtained "by difference" included the whole range of digestibility, from the almost totally digestible starches to the almost totally indigestible fibers, and the whole range of physiologic availability, from the totally available hexoses and citric acid to the totally unavailable tartaric acid. Attempting to deal with these complexities, certain British workers, in particular McCance and Widdowson (3), undertook to base their calculations on what they called "available carbohydrates" rather than on "carbohydrates by difference." They determined starch, sugars, and dextrins directly, expressed all of these carbohydrates as glucose, and multiplied the total by 3.75, the heat of combustion of this sugar, to obtain calories. This procedure was later modified by the British Medical Research Council which expressed "available carbohydrates" in terms of their starch equivalent (dividing by 1.055 for disaccharides and by 1.11 for hexoses) before applying the factor 4. This procedure automatically introduced a difference of about 5 per cent with the results obtained by the Atwater system.

POSTWAR DEVELOPMENTS

The confusion introduced by the multiplicity of existing methods for computing the caloric values of foods became patent in the international planning of food policy during and immediately after World War II. Interest in calories, which had receded before the justifiable enthusiasm aroused by the advances in protein metabolism and the discovery of vitamins, was revived by several factors: first and foremost was the prevalence of caloric undernourishment throughout the world; other factors included the increased attention given to the role of overeating in the etiology of degenerative diseases and the realization of the importance of proper caloric intake in therapeutic treatment and growth. In particular, the need for allocating and rationing calories brought into sharp focus the differences introduced in computations by different methods. A difference of, say, 5 per cent in the energy content of a staple food could mean a difference of thousands of tons in terms of national or international food allocations. The Second Session of the Conference of the Food and Agriculture Organization meeting in 1946 recommended (4) that "FAO should arrange for joint consultation of experts in nutrition and food statistics from various countries who should develop the principles on which average food composition figures used by individual countries should be based and explore the means whereby comparability of data for international use can be obtained including, if necessary, the revision of tables now used for this purpose." Similarly, a 1946 resolution of the Food and Nutrition Board of the National Research Council (4) asked "that the FAO be requested to promote, at the earliest possible time, international agreement regarding a common basis for the calculation of the nutritional value of important foodstuffs, giving first consideration to the question of calories."

In accordance with these recommendations, the Nutrition Division of FAO called a meeting of a Committee on Calorie Conversion Factors and Food Composition Tables in Washington in February 1947. The Committee concerned itself with four main points: first, the method of computing energy values, dealing in particular with estimation of carbohydrate calories; second, the more accurate estimate of protein content from nitrogen value; third, the problem of the fuel value of alcohol; and fourth, that of organic acids (4).

THE FAO COMMITTEE REPORT

The Committee on which, among others, Professor L. A. Maynard was particularly active, considered carefully the data available at the time which covered Atwater's work, the studies of the old Bureau of Home Economics of the United States Department of Agriculture, the data of McCance and Widdowson, as well as analyses and results of digestibility studies from a number of areas. It concluded (4) that: "The Committee can find no evidence that Atwater's data, properly used, are not reliable. It must be stressed, however, that Atwater's condensation and averaging of digestion coefficients

TABLE 1

*Gross and physiological energy values of 100 grams of wheat calculated at 15 per cent moisture**

PERCENTAGE EXTRACTION	GROSS VALUE HEAT OF COMBUSTION	PHYSIOLOGICAL VALUES		
		Atwater general factors 4, 9, 4	Individual factors (Atwater method)	McCance *et al.* 1945†
97 to 100	380	343	322	—
100	377	—	—	314
70 to 74	379	344	350	—
75	372	—	—	342

* Reprinted from "Energy-Yielding Components of Food and Computation of Calorie Values" (4).

† McCance, R. A., Widdowson, E. M., Moran, T., Pringle, W. J. S., and Macrae, T. F.: "The chemical composition of wheat and rye and of flours derived therefrom." Biochem. J. 39: 213–222, 1945.

and energy values to give 4, 9, 4 for protein, fat and carbohydrate, designed to facilitate the estimation of the physiological energy of average United States diets, are erroneously used when applied to diets of different types and to individual foods." Table 1 was given to illustrate the misuse of these coefficients. From it, one can immediately see that the use of the 4, 9, 4 coefficients completely masks the 10 per cent difference in availability introduced by substituting whole wheat flour for 70 per cent extraction flour, a fact which may present considerable economic and physiologic importance in situations where the bulk of the calories comes from bread. The continued use of "carbohydrate by difference" was thus recommended with emphatic cautioning against attempts to refine this estimate, for instance, by deduction of fiber. This would lead only to further error since neither the digestion of the residual fraction nor the heat of combustion of the digested portion has been studied, and the coefficient of digestion of "carbohydrate by difference" could certainly not apply to any such new fraction.

As to protein content, it was emphasized that the usual method of estimation, which consists in determining total nitrogen of a food and multiplying it by 6.25, rests on two assumptions: the first is that all the nitrogen in a food is in the form of protein. All foods, however, contain some nonprotein nitrogen and in some foods, such as tubers, roots, and leafy vegetables, the amount of nonprotein nitrogen may be considerable. The other assumption is that all proteins contain 16 per cent nitrogen, which again is not true of all foods. New factors were suggested for a variety of foods by the Committee: 6.38 for milk, 5.55 for gelatin, factors varying from 5.18 to 5.71 for enumerated oilseeds and nuts, and specific factors for wheat (5.70 for refined flour and 5.83 for whole wheat), rye, barley, oats, and rice.

The special problem of alcohol was circumvented by the Committee, which advised that alcohol should not be included in the computation of dietary energy, but that wherever the amount of alcohol consumed per head is reliably known, it should be indicated as such. Finally, a special study dealt with the specific fuel values of organic acids, a problem of interest in such cases as the estimate of the energy value of citrus fruits. In the case of lemon juice, 62.5 per cent of the caloric value comes from organic acids which the "available carbohydrate" method of computation would have omitted.

AGRICULTURE HANDBOOK NO. 8

Two important food composition tables have been issued which applied the Committee's recommendations: in 1949, the FAO *Food Composition Tables for International Use* by Chatfield (5), which is suitable for the preparation of "food balance sheets" (6) and facilitates interregional comparisons; and Agriculture Handbook No. 8 of the United States Department of Agriculture, *Composition of Foods—Raw, Processed, Prepared* (7). In both of these documents, the considerations summarized above concerning calories, carbohydrates by difference, estimation of protein, and so on, were carefully followed. From the viewpoint of the dietitian, Agriculture Handbook No. 8 represents the source of reference whenever precise data are required on calories, as well as on nutrients. It may be considered as the authoritative document as far as American foods are concerned. Caloric values of individual foods, as well as precise calculations of caloric contents of diets, particularly therapeutic and other diets which do not conform to the "normal" American pattern, should be based on its values. An important example would be the "high bulk," low-calorie diets where the use of 4, 9, 4 coefficients would cause a considerable overvaluation.[2]

ERRORS IN INDIVIDUAL ASSESSMENT OF DIETARY ENERGY

It would be unfortunate if this discussion led to the idea that the choice of food composition tables and their use are always the limiting factors in assessing caloric intake of individuals when surveys, questionnaires, "recalls," and generally all methods except those resting on weighing and analysis of duplicate samples are used (9). It may be useful to review briefly the possible sources of errors, to see where those specifically pertaining to food composition tables fit.

First, too many investigators do not appreciate the variability in time of caloric intake. Unlike intake

[2] The use of "short methods" of computation imply an approximation of the same order, and often of even much greater magnitude. They can, therefore, be condoned where precision is not required, but not where accuracy is necessary. The same applied to "share" methods, unless they are based on Agriculture Handbook No. 8. That of Babcock (8) is such a method.

of other nutrients, caloric requirements are conditioned by activity and environmental temperature. This consideration may help to interpret the findings of Yudkin (10). In a well-controlled study of weekly intakes, he found a difference of up to 68 per cent between the highest and the lowest weekly intakes in one individual, of only 2 per cent between the extremes for another one. Where calories are concerned, the length of a study is often less important than control of environmental conditions.

A second source of error is concerned with the techniques of individual surveys. Leitch and Aitken (11) have presented a good critique of the validity and the accuracy of the current methods. It may be useful to add to their comments the point that, generally speaking, individual survey methods seem weakest where calories are concerned. Such factors as the frequent partaking of small carbohydrate snacks, the number and size of spoonfuls of sugar in hot beverages, and individual mannerisms may easily account for variations of several hundred calories, yet escape undetected by cross checks usually designed to verify the intake of proteins, minerals, and vitamins. For example, as to fat, there are wide differences in attitude between various individuals. Some persons remove every part of the visible fat of meat, others eat it with relish. Even if this is elucidated, the degree of fattening of the meat consumed will still remain as an important source of error. Agriculture Handbook No. 8 gives all figures for "lamb, cooked" in terms of meat of "medium fatness," yet the values for "lamb, carcass or side, raw" vary from 206 to 414 calories per 100 gm., or a ratio of 1 to 2. If one adds to this variability the additional variability of the amount of fat used in cooking, this range can reach 1 to 3. Yet the subject under questioning is not usually asked to (and probably could not) give information which will substantially decrease this margin of uncertainty. Similar situations develop in regard to fat content of milk, fried foods, and so on. In all these cases, the fat content (and therefore the caloric content) is the chief variable; proteins, vitamins, and minerals are affected to a much lesser degree. Similarly, the use of household measures entails errors bearing in particular on flour, sugar, and fat, all foodstuffs of essential significance calorically.

Different investigators will deal with these factors in different ways thus making comparisons difficult between figures obtained in different surveys. This, of course, would not affect the validity of comparison between groups if possible "slants" are taken into account. For example, obese individuals, in comparison with normal subjects, will tend to underestimate total caloric intake and, in particular, the intake of fat.

ASSESSMENT OF CALORIC INTAKES OF CHILDREN

The difficulties and sources of errors just mentioned become particularly acute in the case of children. Yet the importance of proper assessment of caloric intake is relatively greater than for adults. First, children have correspondingly larger energy requirements because of their proportionally larger body surface. Second, growth brings about special additional requirements. The work of Macy (12) clearly demonstrates that, in many cases, inadequate caloric intake may be the limiting factor in growth. Furthermore, as has been shown by others, among them Keys (13), many of the symptoms of protein deficiency are similar to, and secondary to caloric deficiency. Recent reports such as that of Lynch and Snively (14) on hypoproteinosis of childhood, can only be accepted at their face value if the possibility of caloric deficiency is eliminated. It may be added that in a slow-growing species like man, the efficiency of growth is poor, the fraction of calories actually stored as body tissue being very small in proportion to those used for maintenance and activity. To detect by dietary history whether this relatively small fraction is included would require very precise methods. It may be useful to review briefly these possible causes of inaccuracy in assessing caloric intakes of children.

The first source of difficulties mentioned above was the variability of requirements and the resultant variability of intakes, even in the case of individuals with good weight control, the principal factors in this variation being irregularities in activity and in exposure to cold. In the case of children, these factors will be obviously very much magnified. Even casual observation of the habits of children reveals enormous differences in physical activity and outdoor exposure from one day to the next. The practice of violent games and sports, emotional factors, and relatively more frequent "small" indispositions make these differences even more acute. When one considers the variability in weekly intake in adults uncovered by the study of Yudkin (10), it is obvious that the variability of intake in children from one week to the next can easily be of the order of 30 to 50 per cent.

The second source of difficulty concerned irregularity in food habits. Here again children present an obviously difficult case. It is often impossible to appraise how much of the portions served are actually consumed; conversely, small caloric snacks and the consumption of candy and sweet beverages are relatively more important and also more variable than for adults and will often escape detection. The proportionately larger surface of children means, of course, a proportionately greater water loss through this surface. Exercise will, therefore, bring about a greater fluid requirement which may be covered alternately by water, fruit juice, sweet beverages, milk, and so on, with variable results as far as caloric intake is concerned. To consider any dietary history as reliable in the face of these handicaps is to exhibit considerable optimism.

Finally, as far as the strict application of the caloric values in food composition tables is concerned, it must be recognized that the theoretical basis is often extremely insecure for several reasons. All the data on digestibility on which the calculations of Atwater and his successors have been based rested on the results of digestibility trials in *adult* individuals. The proportion of nutrients actually available to children, and particularly to small children, may be quite different. Similarly, the composition of the "average" American diets, on which Atwater's percentage coefficients were based, may not apply to children. Certainly it does *not* apply to very small children whose diet is made up of relatively few items. The foods themselves may be different. In particular, there is no equivalent in adult diets of the highly processed "baby foods" where a great deal if not all "indigestible" material has been removed. Extrapolating the values obtained in the digestibility of normal foods by adults to the digestibility of "baby foods" by small children seems at best an approximate procedure.

The only logical conclusion is that whenever metabolic considerations in children are concerned, only complete balance studies, with analysis of duplicate food samples and determination of the "fuel value" of the excreta, will do. There is actually great need of such studies and in particular of good digestibility experiments on children. For the time being it is well to remember that when dietary histories are used as an investigative or clinical tool, the range of variation and the possible range of errors considerably exceeds the proportion of calories consumed which represents the difference between successful growth or failure of development.

CONCLUSION

Three main conclusions can be derived from this discussion:

The first is that at the present time, only the Atwater system of individual coefficients will give accurate values. For any study where precision in calories is required, the United States Department of Agriculture Handbook No. 8 and the "long method" of calculation should be used.

The second is that investigators should remember that caloric intake varies with requirements, and therefore intakes will vary with a number of factors which do not affect other nutrients. In choosing the length of period for study, this should be taken into account.

Finally, current methods of dietary studies show much greater imprecision regarding calories than regarding other nutrients, such as protein. These errors will be minimized if their causes are recognized.

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Salt Content and Rancidity in Frozen Bacon

The Bureau of Animal Industry reports that rancidity develops in freezer-stored bacon in proportion to the amount of salt with which it is dry-rubbed. Lots of bacon were rubbed with various proportions of common salt and allowed to cure for 21 days at 38°F. Each of the three lots consisted of six samples. The percentages of salt used on the lots were 2, 3, and 4 by weight; the respective average salt contents of these lots were 1.62, 2.87, and 4 per cent. Rancidity developed fastest in the lot having the most salt.

Appreciable advance toward rancidity took place during the curing period and much more rapidly in the outside than the inside fat. The masking flavor of the salt accounts at least in part for the fact that considerable chemical change occurs in the flavor of cured bacon before off-flavors can be detected.—*From the Report of the Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, 1951.*

Amino Acid Intakes and Excretions During Pregnancy[1]

BERNICE B. SHEFT and HELEN OLDHAM, Ph.D.

Department of Home Economics, The University of Chicago

To compare the pattern of amino acid excretion of the pregnant woman with that of other individuals, as well as the amino acid intakes and excretions of pregnant women consuming two types of diets, the present investigation was undertaken. It also was hoped if possible to determine the relation of the intakes of any essential amino acids to total nitrogen balances.

EXPERIMENTAL PROCEDURE

Thirteen women[2] living in their own homes on self-selected diets were studied during the latter half of pregnancy. The diets of six subjects included meat, while those of seven were ovo-lacto vegetarian in that they contained milk, cheese, and eggs, but no meat or fish. Periods of study were of seven days duration and were repeated during each of the last five months of pregnancy for the majority of the subjects. A description of the subjects, the methods used in obtaining the complete output of urine and feces and in obtaining representative samples of all food consumed, as well as the preparation of composites of these materials for analyses, have been reported elsewhere (1, 2), as have been the intakes of essential nutrients of each subject.

Weekly food composites and weekly urine composites were analyzed microbiologically for total arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, and valine after acid hydrolysis and for total tryptophan after enzymatic hydrolysis. The acid hydrolysis was carried out in the case of food composites by making aliquots 3 N with 6 N hydrochloric acid and in the case of urine by making aliquots 2 N with 1:1 sulphuric acid, after which the acidified samples were autoclaved for 5 hr. at 15 lb. pressure. After cooling, the hydrolyzed food samples were filtered, made to volume, and aliquots neutralized and made to the proper volume. The hydrolyzed urine samples were neutralized, filtered, and made to volume with further dilutions when necessary. The enzymatic hydrolysis[3] was carried out according to the procedure of Greenhut *et al.* (3). For urine samples[4], however, only one-fourth the recommended amounts of enzymes were used as the results obtained with the smaller amounts were as high as with the larger. In addition, the results were more consistent when the smaller amounts were used due to the lower values of the enzyme blanks. All samples were incubated under toluene for 80 to 90 hr. at 37°C. with occasional shaking. After incubation, the samples were made to volume and filtered, after which suitable aliquots were neutralized and further diluted to the appropriate concentration.

The method of Henderson and Snell (4) employing a uniform medium for the determination of amino acids with various microorganisms was used with minor modifications for the determination of all amino acids except tryptophan. Assays were conducted on the semi-micro scale. Titration was with 0.02 N sodium hydroxide using the glass electrode assembly described by McQuarrie and Konen (5). Tryptophan was determined by the microbiologic assay of Greenhut *et al.* (3). The assay was conducted in a total volume of 10 ml. Titration was with 0.1 N sodium hydroxide, using Brom Thymol Blue as an indicator.

Lactobacillus arabinosus 17-5 was used for the determination of isoleucine, leucine, valine, phenylalanine, and tryptophan; *Streptococcus faecalis* for arginine, methionine, and threonine; and *Leuconstoc mesenteroides* P-60 for histidine and lysine.

RESULTS AND DISCUSSION

The ranges of the average daily intakes of ten amino acids as well as the mean intakes for each

[1] This study was supported in part by a grant from the National Dairy Council on behalf of the American Dairy Association. Received for publication September 7, 1951.

[2] Six of the women were patients at the Chicago Lying-In Hospital. Seven were patients of W. W. Frank, M.D. and F. M. Brayshaw, M.D., members of the staff of the Hinsdale Sanitarium and Hospital, Hinsdale, Illinois.

[3] The trypsin and erepsin were supplied by Wilson Laboratories, Chicago.

[4] All urine was collected under toluene only.

TABLE 1

Average daily intakes of five amino acids of thirteen pregnant women

SUBJECT	WEEKLY PERIODS	ARGININE		HISTIDINE		ISOLEUCINE		LEUCINE		LYSINE	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Non-Vegetarians											
		gm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
16	5	3.31–4.53	3.96	1.83–2.31	2.01	3.09–6.23	4.67	4.31–8.04	6.34	4.38–5.96	5.33
17	5	2.25–3.40	2.80	1.25–1.98	1.58	2.54–4.15	3.29	4.46–6.99	5.60	2.77–4.67	3.73
18	5	2.82–4.22	3.45	1.11–2.09	1.63	2.99–4.90	3.60	4.83–6.74	5.70	3.80–5.87	4.49
19	5	2.54–3.53	2.96	0.95–1.55	1.21	2.90–4.35	3.48	4.31–5.41	4.82	1.96–4.82	3.34
20	5	2.95–3.73	3.15	1.07–1.98	1.34	2.62–3.74	3.01	4.05–5.66	5.04	2.89–5.66	3.93
21	4	2.24–4.25	3.17	0.92–1.58	1.26	2.04–3.36	3.02	3.33–5.35	4.66	3.18–4.24	3.58
Average			3.25		1.51		3.51		5.36		4.07
Ovo-Lacto Vegetarians											
22	5	3.32–4.35	3.67	1.69–2.01	1.84	3.33–4.03	3.75	5.61–6.88	6.40	3.65–5.22	4.33
23	4	2.81–3.36	3.06	1.61–1.84	1.72	3.68–4.40	4.12	5.79–6.62	6.40	3.77–4.39	4.07
24	5	2.63–3.16	2.91	1.47–1.78	1.66	2.81–3.54	3.16	3.91–5.96	4.79	3.09–4.02	3.34
25	4	2.28–2.69	2.51	1.43–1.61	1.53	2.63–3.01	2.84	4.35–5.33	4.69	3.08–3.59	3.38
26	5	2.39–3.54	3.01	1.16–1.42	1.30	2.37–4.14	3.31	4.38–5.39	5.00	3.16–4.49	3.72
27	3	2.57–3.28	2.88	1.46–1.77	1.57	2.75–3.42	3.06	4.69–5.49	5.10	2.69–3.46	3.04
28	5	2.08–3.16	2.47	1.17–1.67	1.33	2.56–3.65	2.93	4.07–5.21	4.66	2.35–3.75	3.08
Average			2.93		1.56		3.31		5.29		3.57

subject and the number of seven-day periods that each subject was studied are presented in Tables 1 and 2. The mean intakes of the non-vegetarians and the ovo-lacto vegetarians are also presented. It will be noted that there were greater ranges in the average daily amino acid intakes of the non-vegetarians than in those of the ovo-lacto vegetarians. Although the mean intakes of the non-vegetarian group were slightly higher than those of the other group, for the most part, they were very similar. The greatest difference occurred in the case of methionine, the non-vegetarian group having a mean intake 23 per cent greater than the vegetarian group. As shown in Table 3, the mean daily nitrogen intakes of the two groups were also similar, that of the non-vegetarian group being 10.41 gm. and that of the vegetarian, 10.47 gm.

An examination of the diets of the two groups with respect to the types of food included provided an explanation for the similarity in both the total nitrogen and the amino acid intakes. Although the diets of the vegetarian group contained no meat, they contained larger quantities of dairy products and eggs than those of the other group. The average daily milk consumption of the vegetarians was 1½ pt. with five of the seven subjects drinking this amount or more, whereas the average daily milk consumption of the non-vegetarians was 1 pt. with only two of the six subjects drinking 1½ pt. or more. The average daily consumption of cheese of the vegetarians ranged from 0.5 oz. for three subjects to 1 oz. or more for four subjects; for the non-vegetarians, from negligible quantities for two subjects to 2.5 oz. for one. Although the women in both groups ate variable quantities of eggs and ice cream, the average daily consumption of both was greater by the vegetarian than by the non-vegetarian group. The vegetarians also consumed in varying amounts certain foods made from cereals and legumes.

The over-all average nitrogen intake and balance for each of the subjects is presented in Table 3. Those for individual periods have been reported elsewhere (2). Only two of the thirteen women were retaining an appreciable amount of nitrogen, and no relationship between the nitrogen intakes and balances was apparent.

Therefore, the possibility was considered that the intakes of certain essential amino acids might have been disproportionately low in relation to others and thereby have influenced the nitrogen balances. To ascertain whether or not this was the case, the amino acid intakes were expressed as multiples of the suggested allowances for young men (6), the only available figures for human requirements of amino acids. The intakes of methionine, when so expressed, were always the lowest and only occasionally met the recommended allowance of 2.2 mg. Since the intake of cystine, which was not determined, might have influenced the methionine requirement, the data were examined for the amino acid which ranked second as a possible limiting factor. In all cases this was either tryptophan and/or phenylalanine, the intakes of which, however, in almost every instance met or exceeded the suggested allowances.

TABLE 2

Average daily intakes of five additional amino acids of thirteen pregnant women

SUBJECT	WEEKLY PERIODS	METHIONINE		PHENYLALANINE		THREONINE		TRYPTOPHAN		VALINE	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Non-Vegetarians											
		gm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
16	5	1.95–2.78	2.28	2.49–4.37	3.25	3.22–4.25	3.79	0.75–1.01	0.84	3.88–5.76	4.75
17	5	1.50–2.23	1.81	2.13–3.49	2.93	2.27–3.27	2.78	0.59–0.88	0.71	3.01–4.24	3.68
18	5	1.66–2.33	2.02	1.87–3.56	2.74	2.66–3.66	3.13	0.59–0.95	0.78	3.33–4.64	4.13
19	5	1.53–2.00	1.72	2.51–3.28	2.87	2.55–2.95	2.79	0.38–0.74	0.55	2.89–4.25	3.61
20	5	1.31–1.79	1.57	2.17–3.08	2.59	2.12–2.59	2.36	0.44–0.76	0.56	3.13–3.68	3.35
21	4	0.69–1.95	1.38	1.68–2.95	2.39	1.80–2.55	2.31	0.43–0.66	0.53	1.93–4.05	3.23
Average			1.80		2.80		2.86		0.66		3.79
Ovo-Lacto Vegetarians											
22	5	1.43–2.19	1.82	3.44–4.30	3.88	2.94–3.61	3.31	0.76–1.06	0.91	3.66–5.59	4.39
23	4	1.34–1.64	1.45	3.22–3.83	3.51	2.61–3.31	2.88	0.56–0.95	0.68	3.97–4.71	4.23
24	5	1.13–1.71	1.41	3.13–3.52	3.24	2.25–2.90	2.51	0.54–0.80	0.72	3.36–4.00	3.68
25	4	1.42–1.68	1.59	2.86–3.11	2.95	2.27–2.41	2.37	0.59–0.79	0.71	3.28–3.76	3.57
26	5	1.00–2.22	1.77	2.72–3.14	2.89	1.95–2.80	2.43	0.69–0.78	0.72	2.82–4.09	3.62
27	3	1.02–1.41	1.17	2.61–3.21	2.89	2.22–2.30	2.26	0.48–0.57	0.52	3.28–3.38	3.34
28	5	0.77–1.20	1.01	2.14–3.05	2.54	1.76–2.60	2.18	0.45–0.63	0.54	3.10–3.88	3.46
Average			1.46		3.13		2.56		0.69		3.76

The intakes of the other five essential amino acids, for the most part, ranged from about two to almost four times the suggested allowances. However, no correlation was observed between the nitrogen balances and the intakes of either methionine, phenylalanine, or tryptophan. Therefore, the relatively low intakes of these amino acids evidently were not limiting, provided that the amino acid requirements of the pregnant woman follow the same pattern as those of the young man.

The ranges of the average daily excretions of the ten amino acids and the mean excretions for the individual subjects, the mean excretions for the two groups, and the weight ranges of the subjects are presented in Tables 4 and 5. The ranges of the average daily excretions of the subjects of the two groups were comparable as were the mean excretions with the exception of methionine and lysine. The mean excretion of methionine of the vegetarian group was 20 per cent lower than that of the non-vegetarian, with excretions of individuals consistently showing this trend. This undoubtedly was the result of the lower methionine intake of the vegetarian group, since methionine was the one amino acid studied the excretion of which showed a significant correlation with intake. The mean lysine excretion of the vegetarian group was 36 per cent higher than that of the non-vegetarian on a mean intake which was 12 per cent lower.

There were pronounced differences in the excretions of individuals, however, regardless of group. For example, the excretions of Subject *22*, for the most part, were markedly higher than those of any other subject, whereas her intakes were no higher than those of Subject *16*. Subject *22* was one of the largest women of the group, and it has been sug-

TABLE 3

Average daily nitrogen intakes and balances of thirteen pregnant women

SUBJECT	AVERAGE DAILY NITROGEN INTAKE	AVERAGE DAILY NITROGEN BALANCE
Non-Vegetarians		
	gm.	*gm.*
16	13.08	0.99
17	10.42	0.76
18	10.32	−0.64
19	9.96	−0.26
20	9.48	0.01
21	9.18	−0.56
Average.....	10.41	0.05
Ovo-Lacto Vegetarians		
22	12.71	−0.28
23	11.21	−0.02
24	10.97	0.10
25	10.47	−0.50
26	10.28	−0.43
27	9.32	−0.05
28	8.30	−0.06
Average.....	10.47	−0.18

TABLE 4

Average daily excretions of five amino acids of thirteen pregnant women

SUBJECT	WEIGHT	ARGININE		HISTIDINE		ISOLEUCINE		LEUCINE		LYSINE	
	Range	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Non-Vegetarians											
	kg.	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*
16	63.2–71.0	24.4–43.2	35.4	145.0–604.6	371.7	5.8–20.0	10.9	31.5–47.4	37.3	56.0– 76.5	66.2
17	53.2–60.0	26.8–40.3	34.1	478.7–628.8	516.0	9.6–21.2	13.4	29.6–37.4	33.5	43.1– 72.5	57.7
18	55.9–63.7	27.0–38.6	31.7	387.7–509.4	457.0	6.3–20.5	12.0	25.6–35.2	30.7	60.3– 93.0	74.0
19	65.9–67.8	31.8–37.6	35.6	251.6–390.7	315.5	14.7–19.9	17.9	22.8–32.5	29.4	76.5–174.1	135.3
20	55.9–61.4	27.3–46.0	35.1	238.7–377.9	323.2	14.6–18.9	16.7	20.8–38.3	29.5	51.9– 92.5	65.9
21	93.6–95.5	41.2–51.3	48.2	368.8–813.1	645.4	20.4–22.6	21.5	41.3–53.0	45.9	121.9–139.3	131.4
Average			36.7		438.1		15.4		34.4		88.4
Ovo-Lacto Vegetarians											
22	80.9–86.3	51.7–75.5	59.8	794.7–880.0	821.7	17.2–27.6	22.1	41.0–64.0	51.5	132.2–276.9	209.7
23	57.7–63.2	27.1–36.5	33.1	376.9–524.8	434.8	12.0–21.7	17.7	19.6–39.8	31.0	70.3–104.2	88.3
24	53.6–61.5	23.8–31.2	29.4	194.8–210.5	203.2	12.5–15.9	13.7	23.9–34.7	30.7	76.2–164.8	132.1
25	61.4–64.8	34.1–43.3	38.9	386.3–452.3	429.7	14.4–18.1	16.4	34.6–47.2	42.3	73.5–173.2	146.5
26	66.4–74.1	36.2–41.5	39.0	332.8–508.2	418.7	12.9–16.7	14.6	28.0–34.1	30.0	57.3–142.0	107.1
27	50.3–52.4	34.6–42.9	40.1	440.6–581.9	509.6	14.1–17.5	15.8	30.0–34.0	31.7	73.9–129.5	102.1
28	49.5–54.7	25.1–37.9	32.4	354.4–495.9	434.8	5.4–14.8	12.2	19.7–33.8	27.0	50.4– 70.6	55.7
Average			39.0		464.6		16.1		34.9		120.2

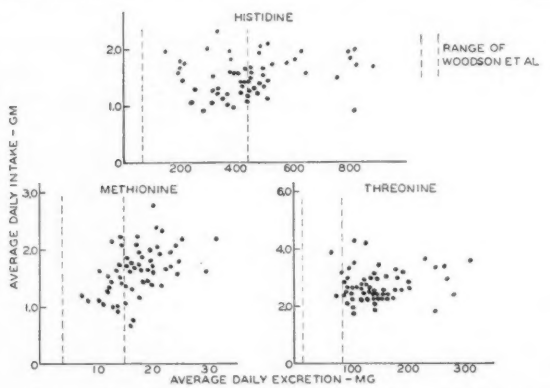

FIG. 1. *Intakes and excretions of histidine, methionine, and threonine.*

gested by Thompson and Kirby (7) that excretions of certain amino acids are related to weight. However, Subject *25*, who weighed less than Subjects *16* and *26*, consistently had excretions which equalled or exceeded those of the heavier subjects. Therefore, in the subjects of the present study, individual differences in amino acid excretions cannot be explained either on the basis of intake or of body weight.

The excretions of the subjects of this study can be compared with those of pregnant women reported by Wallraff *et al.* (8) only on the basis of "total" amino acids. With the exception of lysine, which was excreted in larger amounts by the subjects of the present study, the excretions observed in the two studies were comparable.

The excretions of the women of this study can also be compared with those reported for non-pregnant individuals by Woodson *et al.* (9). These results were selected as a basis for comparison since they represent the largest single group of individuals studied, because they are in agreement with those reported by others (10–12), because no sex differences have been noted in amino acid excretions, and because the ranges of excretion as well as the means are available. When such a comparison is made, the excretions of isoleucine, lysine, phenylalanine, and tryptophan lie within the ranges reported for non-pregnant individuals. Those of arginine, leucine, and valine also lie within the normal ranges but in the upper part. The mean histidine excretion was definitely higher than that of the non-pregnant individuals as has been repeatedly observed since first noted by Voge (13). However, excretions above the range reported by Woodson were noted in only one-half of the periods of study (Fig. 1).

As indicated in a preliminary report on five of these women (14), the excretions of methionine and threonine were markedly higher in the pregnant than in the non-pregnant individuals. The average daily methionine excretions were above Woodson's range in approximately two-thirds of the periods of observation, the mean excretion of the subjects of the present study being 17.2 mg. and that of Woodson's subjects 8.6 mg. The difference between the threonine excretions of our subjects and those of

TABLE 5

Average daily excretions of five additional amino acids of thirteen pregnant women

SUBJECT	WEIGHT	METHIONINE		PHENYLALANINE		THREONINE		TRYPTOPHAN		VALINE	
	Range	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Non-Vegetarians											
	kg.	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*	*mg.*
16	63.2–71.0	17.8–25.2	20.9	22.4–33.6	26.7	65.6–124.8	95.6	12.9–28.0	23.6	23.8–42.1	30.9
17	53.2–60.0	16.1–19.3	17.6	23.0–38.8	31.8	139.6–181.6	166.4	30.4–39.1	34.8	27.5–35.8	31.4
18	55.9–63.7	16.3–24.1	20.0	22.4–39.3	30.4	148.3–231.9	187.8	48.2–63.7	56.7	26.8–31.8	28.7
19	65.9–67.8	13.7–24.3	20.2	19.7–27.3	23.6	90.4–146.5	121.6	21.2–26.5	24.7	22.7–28.8	25.9
20	55.9–61.4	14.0–21.3	17.4	23.9–34.2	29.6	88.2–142.8	116.0	38.8–44.7	41.0	18.5–26.4	24.0
21	93.6–95.5	15.9–22.9	19.7	22.1–31.3	28.3	186.1–278.0	224.5	46.6–63.4	55.2	36.4–38.0	37.0
Average....			19.3		28.4		152.0		39.3		29.7
Ovo-Lacto Vegetarians											
22	80.9–86.3	14.3–31.3	22.3	43.7–51.3	47.2	188.2–307.9	254.0	50.3–57.5	55.2	33.4–57.1	42.8
23	57.7–63.2	10.4–19.4	13.6	20.4–33.7	24.8	94.0–127.4	115.6	24.6–39.9	31.2	18.8–27.8	25.6
24	53.6–61.5	8.4–15.1	12.4	18.8–32.7	26.8	72.0–119.4	92.4	17.8–24.4	20.6	21.8–28.8	24.9
25	61.4–64.8	17.7–22.3	19.5	36.9–47.7	44.1	143.2–153.7	151.0	42.0–55.5	51.7	29.0–41.2	35.5
26	66.4–74.1	12.7–15.4	13.9	25.8–32.0	28.2	98.0–143.8	122.1	26.1–34.2	30.4	23.3–31.6	28.1
27	50.3–52.4	13.0–15.1	14.2	20.3–29.6	23.8	103.6–154.8	128.2	26.3–32.9	29.4	21.7–26.6	24.8
28	49.5–54.7	7.4–16.1	11.7	15.2–25.8	19.4	105.1–155.6	136.8	24.1–36.2	30.4	17.9–28.9	23.7
Average....			15.4		30.6		142.9		35.6		29.3

Woodson was even more pronounced, the mean daily excretions being 147.1 mg. and 53.8 mg. respectively. Furthermore, threonine excretions were consistently above Woodson's range (Fig. 1).

These results have been confirmed by a supplementary study in which the amino acid excretions of twelve additional pregnant women[5] living in their own homes on self-selected diets were determined. In these women, also, threonine, methionine, and, to a lesser extent, histidine were the only essential amino acids which were excreted in larger quantities than those reported in the literature for non-pregnant individuals.

SUMMARY

The intakes and excretions of total arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine are reported for thirteen pregnant women during the latter half of pregnancy. The women lived in their own homes on self-selected diets, which in the case of seven women were ovo-lacto vegetarian in nature.

With the possible exception of methionine, the amino acid intakes of the ovo-lacto vegetarians were comparable to those of the non-vegetarians. An explanation for this is the larger quantity of dairy products and eggs consumed by the ovo-lacto vegetarians.

The intakes of methionine, phenylalanine, and tryptophan ranked lowest when expressed as multiples of the recommended allowances for young men. However, no relationship was apparent between the intakes of these three amino acids, when so expressed, and the nitrogen balances.

The excretions of total arginine, isoleucine, leucine, lysine, phenylalanine, tryptophan, and valine were within the ranges reported for non-pregnant individuals. The excretions of histidine, methionine, and threonine were markedly higher in these women than those reported for non-pregnant individuals with the increased excretion of threonine being the most pronounced.

[5] The authors were kindly given aliquots of three-day urine collections of patients of The Chicago Lying-In Hospital.

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BIOGRAPHICAL NOTES FROM THE HISTORY OF NUTRITION

Galen—130–200 A.D.

The development of nutritional knowledge has had to wait for progress in medicine, physiology, and chemistry; therefore, one can justifiably include the early men of medicine and science in the history of nutrition. Galen, who was born around 130 A.D. and died about 200 (there is no certainty of the dates), influenced the progress of science for a longer period than any other single individual. He was a prolific writer, and his writings were accepted without question until the time of Vesalius. Andreas Vesalius (1514–1564) was a young Flemish-born student who refused to accept the voice of authority and investigated for himself, thus founding the modern science of anatomy.

Galen was born in Pergamos, the son of a wealthy architect. He studied philosophy at fifteen, and at eighteen began his study of medicine. He studied anatomy and wrote extensively on the subject, including the anatomy of man; however, since his dissections were mainly on apes and swine, there were many errors in his writings on human anatomy. In 164 A.D., Galen arrived in Rome and became physician to Emperor Marcus Aurelius and surgeon to the gladiators. He was the first experimental physiologist; he was the discoverer of the cranial nerves and some of his nomenclature for muscles is still in use today. He attributed epidemic fevers of that time to the drinking of infected water.

Everything was of interest to Galen and for everything he had an answer; he would not admit doubt or error. He was interested in dietetics, and, as Victor Robinson says, "There is little in the realm of dietetics, from pistachio nuts to flesh of buck-goats that was not considered by him, and the diet fitting to the different seasons, the diet of persons actively employed, the diet of travellers, the regimen of infants and aged, repletion and easy methods to produce vomiting are only a few of the dietetical topics he discussed sagaciously." Galen also believed that food was taken up from the alimentary canal and carried by the portal vein to the liver where it became enriched with "natural spirits" and was transformed into blood which passed on into the heart.

Galen travelled widely to Smyrna, Alexandria, Corinth, Asia Minor, Palestine, and Sicily, no mean itinerary for that period, to learn all he could about medicine of those regions. His name, Galen, means "peaceful," but is certainly a misnomer for he was haughty and over-bearing. However, he was a skillful physician and a good investigator in physiology; the tragedy for science was that his teachings were accepted as final for the next twelve hundred years.

References: Practically every book on the history of medicine tells something of Galen, and there are numerous articles about him and his work in the *Annals of History of Medicine.*—*Contributed by E. Neige Todhunter, Ph.D., Head, Department of Foods and Nutrition, University of Alabama, Tuscaloosa.*

Enamel Erosive Properties of Fruits and Various Beverages[1]

CAREY D. MILLER[2]

Foods and Nutrition Department, Agricultural Experiment Station, University of Hawaii, Honolulu

A PREVIOUS study (1) showed that acid fruits have little or no erosive effect upon the lingual enamel when fed to rats for a period of five days but that juices made from an equivalent weight of fruit, or even half the equivalent, may cause marked erosion.]

This paper reports *in vivo* studies with additional fruits and their juices, combinations of fruits and juices, fruits with added acid, commercially prepared fruit juices, synthetic and other beverages, and a solution of acid candy. An *in vitro* study was also made using rat and human teeth with an acid fruit and its juice.

PROCEDURE

A standardized procedure which has been described fully elsewhere (1) was used for all *in vivo* experiments. Briefly, young rats, both male and female, were maintained in separate cages, on the stock diet to six to eight weeks of age when they were fed the supplements for a period of five days (Monday through Friday) and on the sixth day the rats were killed. Approximately one rat out of every ten was used as a positive control receiving only the stock diet and water. The teeth were prepared for examination by staining with Alizarin Red and scored as previously reported (1). Only the molars of the mandible were scored because, in comparison, the upper molars were very slightly affected. High polish of lingual enamel, slight etching, mild destruction, moderate destruction, and severe destruction were graded, respectively, 1, 2, 3, 4, and 5. Determinations for *p*H and titratable acidity were made as described earlier (1).

To determine the *in vitro* effect of an acid juice versus an acid fruit, teeth were immersed in the two products and the increase in the calcium content determined after a period of incubation.

For Experiment *I*, normal teeth from three rats nine weeks of age were removed from the jaws and imbedded in paraffin to the gum line. Matched sets of teeth (from right and left sides) were then placed in 50 gm. guava juice and 50 gm. minced guava shells (pulp). The juice and the shells were from different lots of guavas; the juice was a home-prepared bottled product and the minced raw guava shells had been frozen. After immersion of the teeth in the juice and the pulp, the flasks were incubated at 36°C. for 3 hr. At the end of that time the teeth were removed, and the calcium contents of the juice and pulp were determined and compared with those of a like quantity of the original products. The results were so striking that the experiment was repeated and extended.

For Experiment *II*, fresh guavas were divided into two lots by cutting each guava in half lengthwise. One lot was used to prepare the guava juice (literally a watery extract) by adding water to the guavas and cooking for 10 min. and then straining. The other lot was cooked with a small amount of water and sieved to make a soft pulp. Fifteen per cent sugar was added to each. By adding a small amount of water to the juice, the weights of the cooked juice and pulp were made equivalent. Both preparations were quick-frozen until used.

Flasks of juice and pulp were sterilized at 10 lb. pressure for 5 min. to eliminate bacterial or enzyme action. One set was used for the controls and incubated together with a second set in which matched normal rat teeth were used as in Experiment *I*, and in a third set of flasks two normal human bicuspids without cavities were placed. The roots were imbedded in paraffin to slightly above the amelocemental junction before immersion in the juice and pulp. Because there was no exposure of dentine on the human teeth (dentine is exposed on the oc-

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[2] Thanks are due Adelia Bauer and Barbara Branthoover for determining the *p*H and the titratable acidity of the fruits and the beverages and to Mildred Higa for her valuable assistance with the animal experiments.

clusal surfaces of the rats' teeth), they were incubated for a longer period, 4 hr. at 36°C., and the rat teeth for 3 hr. at 36°C. as before.

RESULTS

The results of feeding various supplements upon the lingual enamel of rats' teeth will be discussed below for each group of supplements.

Fruits and Their Juices

Different quantities of the five fruits—Boysenberries, orange, passion fruit, Surinam cherry, and tamarind—were fed because they varied greatly in acidity and preliminary trials indicated the approximate amounts the rats would eat. The quantities of fruits and juices used in each case, as well as the average molar scores, are shown in Table 1.

In the case of tamarind, the small amount (2 gm. made from a mixture of 1 gm. fruit pulp and 1 gm. sugar) of the extremely sour fruit fed caused no enamel erosion but 5 ml. of the sweetened juice prepared from an equivalent amount of fruit caused a molar score of 3.5. The other four fruit juices yielded scores three to seventeen times as great as the equivalent amounts of fruit.

Other Fruit and Fruit Combinations

Quantities of guava juice which caused serious erosion as a sweetened beverage, when combined with an equal weight of banana, or with an equal volume of whole milk, caused little or no erosion. When the same quantities of guava juice and milk in separate containers were offered to five rats, the molar scores varied from 2.0 to 3.7, apparently according to the way in which the rats consumed the two beverages (Table 1).

Papaya, an important local fruit grown in all tropical and semi-tropical countries, was fed to five rats at a level of 20 gm. daily for five days; the teeth of all rats were perfectly normal. Papaya is often served with lemon juice, and it has been recommended that citric acid be used with papaya purée for freezing (2). Quantities of lemon juice and citric acid, which as sweetened liquids caused serious enamel erosion, had no effect when they were combined with mashed papaya and sugar and 20 gm. of the mixtures were fed daily. Even when the amount of acid in each case was doubled so that the mixture had a very tart taste, the scores were less than 1. (See scores for lemonade and citric acid, Table 1.)

Commercially canned sliced pineapple, when minced and mixed with the juice from the can, caused only slight enamel erosion (mean molar score, 0.6) as did fresh pineapple previously reported (1).

Commercially Prepared Fruit Juices

Four commercially canned or bottled fruit juices were fed—apple, grape, orange, and pineapple.

The rats refused to drink more than 5 to 6 ml. apple juice daily so that no satisfactory comparison could be made with the other commercial fruit juices.

The rats did not take the undiluted grape juice well, and it was necessary to remove water cups from the cages to obtain complete or almost complete consumption. When one part of grape juice was diluted with two parts of water and 5 per cent sugar was added, the rats drank the mixture well, but the molar score was again high—4.1 compared with 4.6 for the undiluted grape juice.

Canned orange juice and frozen orange concentrate reconstituted as directed were well accepted by the rats only when sugar and water were added in the proportions shown in Table 1. Ten ml. of each orange product produced the same degree of erosion (mean scores of 2.4 and 2.5), but doubling the quantity of the juices, though causing rather severe damage to the enamel, did not double the scores (3.3 and 3.5).

Commercially canned pineapple juice when fed as a 20-ml. supplement for five days caused a greater amount of enamel erosion (score of 2.9) than the same amount of a less acid fresh pineapple juice (score of 1.8).

On the basis of the quantities fed, the enamel erosive properties of three popular commercially canned fruit juices were, in decreasing order of severity: grape juice, orange juice, and pineapple juice.

Home Prepared Fruit Juices

Six home prepared juices were tested for their enamel erosive properties, namely: sweet and sour carambola (*Averrhoa carambola*), ketambilla (*Dovyalis hebecarpa*), lemon, yellow passion fruit (*Passiflora edulis* var. *flavicarpa*), and pineapple.

The two varieties of carambola look alike, but even when ripe one is much more tart. The juice was made by cutting the fruit in small pieces and squeezing in a coarse cloth. One part juice was diluted with two parts of tap water and 10 per cent sugar was added to the sweet carambola juice and 20 per cent to the sour juice. After five days' feeding of 20-ml. supplements of each juice, the lingual surfaces of the rats' molar teeth appeared normal.

No fresh ketambilla (*Dovyalis hebecarpa*), an extremely acid tropical fruit, were available for testing, but one part of a pulpy bottled juice prepared as for household use was diluted with ten parts of water, and 15 per cent sugar was added. Six rats fed 20 ml. of the diluted sweetened juice had an average molar score of 4.2.

The lemonade was made by a standard recipe, and the daily supplement of 20 ml. contained water, 1 gm. lemon juice, and 20 per cent sugar. When fed to six rats it caused a mean molar score of 3.5.

Yellow passion fruit were cut in half, the edible portions scooped from the shells and squeezed through two thicknesses of cheese cloth to make a

TABLE 1

In vivo *decalcifying effect of acid fruits and fruit juices on lower molar teeth of rats**

FRUIT OR JUICE	pH	TITRATABLE ACIDITY	NUMBER OF RATS	DAILY SUPPLEMENT		AVERAGE MOLAR SCORES	
				Fruit	Juice	Fruit	Juices
Fruits and Their Juices							
		ml.		*gm.*	*ml.*		
Boysenberries							
Fruit	3.7	136	6	15		0.6	
Juice = 15 gm. fruit	3.8	189	6		8.5		1.9
Oranges							
Fruit	4.4	134	10	20		0.2	
Juice = 20 gm. fruit	4.2	136	10		14		3.4
Passion fruit							
Fruit	3.6	353	5	5		0.3	
Juice = 5 gm. fruit	3.7	93	6		13		3.5
Surinam cherries							
Fruit	3.6	321	2	7.5		0.8	
Juice = 7.5 gm. fruit	3.6	101	2		15		4.1
Surinam cherries							
Fruit	3.6	321	3	5		0.4	
Juice = 5 gm. fruit	3.6	101	5		10		3.6
Tamarind							
Fruit	3.3	944	5	2		0	
Juice = 2 gm. fruit	3.4	199	5		5		3.5
Other Fruits and Fruit Combinations							
Guava							
Juice (8.5 ml. juice + sugar and water)	3.8	235	4		10		4.1
Juice and banana (8.5 ml. juice, 8.5 gm. banana, 3 gm. sugar)	4.4	136	4	19		0.5	
Juice and milk (10 ml. juice + 10 ml. milk)							
Fed combined	3.8	94	5		20		0
Fed separately			5		20		(2.0 to 3.7)
Papaya							
Fruit alone	5.2	11	5	20		0	
Fruit + 1 gm. lemon juice	3.9	61	5	20		0	
Fruit + 2 gm. lemon juice	3.6	100	5	20		0.7	
Fruit + 0.06 gm. citric acid	4.0	46	4	20		0	
Fruit + 0.12 gm. citric acid	3.6	91	4	20		0.4	
(Citric acid—0.3 gm./100 ml., 10% sugar)	(3.0)	(96)	(10)	(20)			(4.3)
Pineapple, sliced, canned	3.9	165	5	20		0.2	
Commercially Prepared Fruit Juices							
Grape juice							
Undiluted	4.1	147	4		20		4.6
Diluted	4.2	48	5		20		4.1
Orange juice							
Canned (80 ml. juice, 8 gm. sugar, 15 ml. water)							
Test 1	3.2	137	5		10		2.5
Test 2			6		20		3.3
Frozen (80 ml. juice, 4 gm. sugar, 18 ml. water)							
Test 1	3.4	114	5		10		2.4
Test 2			5		20		3.5
Pineapple juice, undiluted	3.8	160	5		20		2.9
Home Prepared Fruit Juices							
Carambola							
Sweet	4.6	16	6		20		0
Sour	3.6	32	5		20		0
Ketambilla	4.1	45	6		20		4.2
Lemonade (1 gm. lemon juice)	4.0	52	6		20		3.5
Passion fruit							
Dilution No. 1	3.0	164	11		20		5.1
Dilution No. 2	3.3	75	5		20		4.2
Pineapple, fresh	4.6	74	10		20		1.8

* 26 control animals received no supplements. Molars showed no erosion; scores were 0.

pulpy juice which was heated and bottled. One part of passion fruit juice prepared in this manner was diluted with three parts of water, and 15 per cent sugar was added. Eleven rats fed 20 ml. daily for five days showed severe enamel erosion and an average molar score of 5.1. When one part of the original juice was diluted with eight parts of water to make a less acid beverage, it still had a marked erosive

TABLE 2

In vivo *decalcifying effect of various beverages on lower molar teeth of rats**

BEVERAGE	*p*H	TITRATABLE ACIDITY	NUMBER OF RATS	AVERAGE MOLAR SCORES
Carbonated Beverages				
		ml.		
Cola drinks				
No. 1	2.6	70	10	1.2
No. 2	3.2	62	5	2.0
No. 3	3.4	37	10	2.6
Gingerale				
No. 1	4.1	65	8	0.1
No. 2	4.0	34	5	2.1
Sodas				
Creme	3.2	52	10	0.9
Grape	4.0	53	5	2.3
Lemon	3.1	42	5	1.4
Lemon, lithiated	3.4	47	5	0.9
Orange				
No. 1	3.2	63	10	1.8
No. 2	3.0	65	5	3.4
Strawberry				
No. 1	3.4	54	10	0.4
No. 2	2.3	56	5	2.5
Root beer				
No. 1	3.2	46	10	0.8
No. 2	3.0	40	5	0.8
Others (nationally advertised)				
No. 1	2.8	42	10	0.8
No. 2	3.4	79	11	1.2
Noncarbonated Beverages				
Beverage powder No. 1				
Orange flavor	3.8	42	5	3.9
Strawberry flavor	4.0	34	5	4.0
Beverage powder No. 2				
Cherry flavor	3.6	12	5	1.6
Orange flavor	3.6	12	5	1.9
"Fruit punch"	3.2	39	5	4.0
Grape drink				
No. 1	3.9	60	5	4.3
No. 2	3.8	62	5	4.3
Orange drink				
No. 1— 5 ml., 4 days	3.0	61	5	1.0
No. 1—10 ml., 4 days	3.0	61	6	1.2
No. 1—15 ml., 4 days	3.0	61	6	1.5
No. 1—20 ml., 4 days	3.0	61	6	3.0
No. 1—25 ml., 4 days	3.0	61	6	3.0
No. 1—30 ml., 4 days	3.0	61	6	3.3
No. 1—20 ml., 5 days	3.8	62	9	3.1
No. 2	3.4	60	5	3.4
Confections Fed as Beverages				
Candy, lime flavor	3.5	37	5	3.4
Sirup for shaved ice, strawberry flavor	4.8	0	5	0.1
Other Beverages				
Buttermilk	4.8	87	5	0
Cocoa	6.4	6	5	0
Coffee	5.3	13	5	0
Tea	6.4	4	5	0

*All beverages were fed as 20-ml. supplements daily for 5 days. Thirty-six control animals received no supplements. Molars showed no erosion; scores were 0.

effect, the average molar score for five rats being 4.2.

Fresh pineapple juice was prepared by squeezing the juice from fresh ripe pineapple and by freezing without sugar. This juice was less acid than the commercially canned juice and gave a lower molar score—1.8 compared to 2.9 for the canned.

Carbonated, Noncarbonated, and Other Beverages

The results of feeding 17 carbonated soft drinks to 129 rats, 9 noncarbonated drinks to 84 rats, and 2 confections fed as beverages to 10 rats are summarized in Table 2. Also in Table 2 are the results of feeding 4 common beverages: buttermilk, cocoa prepared with milk, coffee, and tea.

It was first thought that the enamel erosive effects of the various soft drinks could be predicted by determining their *p*H and titratable acidity, but this proved untrue. Within certain limits, some of the less acid drinks were found as effective in removing the enamel from the lingual surface of the rats' teeth *in vivo* as some of the more acid ones.

Three cola drinks varied in their enamel erosive properties. No. 3, with the lowest acidity, gave an average molar score more than twice as great as the most acid one. Cola No. 3 has a different *p*H in Honolulu (3.4) than in Ithaca, New York (2.5). When preliminary trials were first run on Cola No. 3 in 1948, the *p*H was 2.5, but when the final tests were made in 1949 the *p*H was more than 3.0.

The results on gingerale indicate that there may be differences in the enamel erosive properties of this type of drink. One brand caused practically no enamel erosion, whereas the other gave an average score of 2.

One orange soda produced almost twice as large a molar score as the other, although the acidity was similar.

The use of lithium appears to reduce somewhat the enamel erosive effect of soft drinks. Two lemon sodas sold under the same trade name were compared. The one without lithium gave a molar score of 1.4 and the one with lithium, a molar score of 0.9.

TABLE 3

Solution of calcium from teeth when incubated in guava juice and in guava pulp

GUAVA PRODUCT	*pH*	TITRATABLE ACIDITY	CALCIUM	INCREASE IN CALCIUM CONTENT
		ml.	*mg./100 gm.*	*%*
Experiment *I*				
Juice (control)	3.8	143	5.8	
Pulp (control)	4.1	153	13.6	
Juice after incubation with rat teeth for 3 hr. at 36°C.			12.9	122
Pulp after incubation with rat teeth for 3 hr. at 36°C.			14.4	6
Experiment *II*				
Juice (control)	2.8	143	4.7	
Pulp (control)	2.7	240	7.6	
Juice after incubation with human tooth for 4 hr. at 36°C.			9.8	109
Pulp after incubation with human tooth for 4 hr. at 36°C.			9.0	18
Juice after incubation with rat teeth for 3 hr. at 36°C.			11.0	136
Pulp after incubation with rat teeth for 3 hr. at 36°C.			9.2	21

The Food and Drug Administration regards unfavorably the use of lithium in beverages and has recommended that its use be discontinued.[3]

A second beverage which stated on the label that it contained lithium salts (lithium citrate) was No. 1 under the heading of "Others" (Table 2). It also showed a low molar score of 0.8.

Two brands of root beer and one of strawberry soda produced molar scores less than 1.0. A second brand of strawberry soda resulted in a molar score about six times as great as the first.

The noncarbonated beverages as a group, when fed under our standard conditions of 20 ml. daily for five days, showed more severe enamel erosion of the lingual enamel of rats' teeth than did the carbonated drinks.

The beverage powders were prepared as the labels directed. Powder No. 1 gave a molar score more than twice as great as No. 2. The titratable acidity of Powder No. 1 is almost three times greater than that of Powder No. 2, which in this case may account for the different effect.

The artificial fruit punch containing citric and tartaric acids caused a mean molar score of 4.0.

Two brands of noncarbonated, artificial grape-flavored drinks caused marked erosion, both yielding mean molar scores of 4.3.

[3] Personal communication from G. H. Akau, Acting Chief Food and Drug Administration, San Francisco District.

Orange Drink No. 1 was fed at six different levels for four days and showed increasingly greater molar scores up to 20 ml. (Table 2). This was one of our early tests, after which we uniformly fed all beverages at a 20-ml. level for five days. A second sample of this same widely advertised orange drink showed a different *pH* (3.8 instead of 3.0) but about the same titratable acidity, and the average molar score for nine rats was similar to that for 20 ml. of the first sample. Orange Drink No. 2 had essentially the same enamel erosive effects as No. 1.

Miller and Neuwirth (3) reported that marked decalcification occurs with excessive use of hard candies even when they are not acidified. *In vitro* experiments by West and Judy (4) showed serious destruction of enamel of human teeth using solutions of acid candies at room temperature.

We wished to compare the enamel erosive effects of dissolved acid candies with the soft drinks which we were feeding. Twenty gm. of a hard lime-flavored candy were dissolved in water and made to 100 ml. Twenty ml. of this solution fed daily for five days resulted in an average molar score of 3.4.

When the sirup poured over "shaved ice" to give it color and flavor was fed as 20-ml. supplements, it had only a very slight enamel erosive effect. Although the *pH* was 4.8, the titratable acidity was below 1.

Buttermilk with a *pH* of 4.8 and a titratable acidity of 86.9 had no effect upon the teeth. Likewise sweetened cocoa made with milk and coffee and tea containing 10 per cent sugar had no erosive effects.

Solution of Calcium from Teeth Incubated with Fruit Juice and with Fruit

The solution of calcium from teeth immersed in an acid fruit juice and in pulp prepared from the entire fruit is strikingly shown in Table 3. In the first experiment using normal rat teeth, the calcium content of the juice increased 122 per cent whereas the calcium content of the pulp increased only 6 per cent. In the second experiment, the increases in calcium for the juice and the pulp were 136 per cent and 21 per cent, respectively. For the human teeth, the percentage increases in calcium were somewhat smaller, but the relationships between the increases for the juice (109 per cent) and the pulp (18 per cent) were similar to those for the second set of rat teeth using the same pulp and juice.

DISCUSSION

These *in vitro* experiments demonstrate clearly that human teeth, like rat teeth, are affected differently by an acid fruit and by the juice made from it. The *in vitro* experiments with guava and the *in vivo* experiments with papaya, lemon juice, and citric acid; and with banana and guava juice indicate the much more rapid and severe effects of citric acid solution as contrasted with citric acid added to nonacid fruits or occurring naturally in acid fruits.

Obviously fruit juices supply vitamins and minerals which soft drinks lack. Fruit juices are also more frequently consumed with meals when their enamel erosive effects would tend to be nullified, whereas soft drinks are more often consumed between meals and without food accompaniment. However, the American habit of drinking fruit juices rather than eating fruit (largely because drinking can be done more quickly), plus the increased use of soft drinks (which in rats produce marked enamel erosion) may be factors contributing to the whole picture of increased dental decay in the United States.

Space does not permit discussion of the many aspects of this problem, but three reports are of special interest in this connection.

McClure (5) has reported the reaction of rats' oral cavities to be *p*H 8.0 ± 0.2, which is more alkaline than the average human oral cavity. McCay and Will (6) state that detectable erosion can be produced in rats when fed during one 24-hr. period either 10 ml. of a phosphoric acid-sucrose solution (simulating cola drinks) or 2, 3, or 5 ml. of a 0.58 per cent citric-acid-sucrose solution. These authors also studied the buffer capacity of the human mouth against cola beverages and concluded that human beings vary greatly in their ability to buffer acid solutions of *p*H 2.6. Bieri and co-workers (7) extracted the deciduous incisors of young monkeys before and after daily feeding 160 to 170 ml. of a synthetic lemonade or a phosphoric-acid-sucrose solution, both with a *p*H of 2.6. By comparing the incisors, erosion was evident in the teeth removed at the end of the thirty-day experiment.

Although no one has proved that enamel erosion is conducive to the carious process in human teeth, it seems reasonable to assume that overindulgence in acid beverages of various kinds might cause defects in the enamel of human teeth *in situ* and that if oral and/or systemic conditions were also right for caries production, such defects in the enamel might be foci for infection and decay.

SUMMARY AND CONCLUSIONS

Fruits and fruit juices, soft drinks, and other beverages have been studied for their enamel erosive properties, using standardized rats and a five-day period for feeding the supplements.

Five fruit juices—Boysenberry, orange, passion fruit, Surinam cherry, and tamarind—gave enamel erosion scores three to seventeen times as great as the equivalent amounts of fruit from which they were made.

The enamel erosive properties of guava juice were counteracted by combining the juice with banana or with milk. Amounts of citric acid and of lemon juice, which as sweetened beverages caused serious enamel erosion, had no effect when combined with papaya.

Canned pineapple had less than one-tenth the enamel erosive effects of canned pineapple juice.

Commercially prepared (bottled, canned, or frozen) grape, orange, and pineapple juices all caused enamel erosion, but pineapple juice was judged, on the basis of molar scores and the concentrations fed, to have about two-thirds the effect of the other two juices.

Only two out of six home-prepared fruit juices showed no enamel erosive effects —sweet and sour carambola. In order of increasing effect, the other four juices were: pineapple, lemon (as lemonade), ketambilla, and passion fruit.

Seventeen carbonated and nine noncarbonated drinks were tested. On the whole, the carbonated drinks caused less enamel erosion than did the other artificially colored and flavored beverages. Many of the soft drinks had as great enamel erosive effects as the fruit juices, but it was not possible to predict their enamel erosive properties on the basis of *p*H and titratable acidity.

An acid-flavored candy dissolved in water and fed as a beverage caused about the same degree of enamel destruction as two noncarbonated "orange drinks."

Buttermilk, milk, cocoa, coffee, and tea, as well as the sirup poured over shaved ice, showed no enamel erosive effects.

Matched sets of rat and human teeth were immersed in guava juice and guava pulp and incubated at 36°C. for 3 hr. for rat teeth and 4 hr. for human teeth, using control flasks of juice and pulp. The calcium content of the juice increased 136 per cent for the rat teeth and 109 per cent for the human teeth; for the pulp, the increases were 21 per cent and 18 per cent, respectively.

Concentrations of citric acid which in solution have marked enamel erosive effects lose this property when they occur naturally in fruit or are combined with a nonacid fruit (or with milk).

It is suggested that overindulgence in soft drinks, acid-flavored candies, and acid fruit juices may play a part in promoting dental decay.

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Effect of Holding on Bacterial Count and Palatability of Meat Loaves

Before and after Freezing and after Reheating[1]

RACHEL M. ICE, KARLA LONGRÉE, Ph.D., FAITH FENTON, Ph.D., and KATHARINE W. HARRIS

New York State College of Home Economics, Cornell University, Ithaca

MOST of the reports of research concerned with frozen cooked food which were found in the literature have been directed toward problems of home or commercial production; little if any work has been reported on the freezing of cooked foods in institutional food services where freezer space may be used for storing cooked foods prepared in advance for peak periods of service or as a method of storing leftovers until they can be served. Information is needed about the palatability and the wholesomeness of these foods after freezing, storage, thawing, and reheating.

The purpose of this research was to study the effect of different conditions and lengths of holding times before freezing, of freezing, storage, thawing, and of different treatments after thawing on the palatability and bacterial plate counts of precooked meat loaves made and served in quantity. Bacterial plate counts of the individual ingredients in the meat loaves were also made.

Few reports were found in the literature on the bacteriology of frozen cooked foods. Fenton and Darfler (1) have pointed out that the danger of bacterial contamination is greater in frozen cooked foods since the food is partially broken down by the cooking. The cooking may sterilize the food, but there is chance for contamination in further handling; cleanliness and sanitation in handling food for freezing is imperative since freezing does not necessarily sterilize the food. Rapid cooling is less likely to result in spoilage, since the foods remain for a shorter time in the temperature range for optimal growth of the bacteria. When leftovers are being frozen, it is particularly important to be careful, because the food may have been contaminated during holding.

Fitzgerald (2) stated that frozen cooked foods should be looked on as a potential health hazard. Sanitation controls should be aimed at two objectives: first, to keep contamination to a minimum to avoid the possibility of the development of off-quality during processing, storage, distribution, and in consumers' hands; second, to keep the "most probable number" (M.P.N.) value for coliform organisms low to avoid the possibility of including pathogenic organisms and thus prevent illness in cases where subsequent reheating might not kill all such organisms.

Jensen (3) stated that to provide a safety margin against the action of Staphylococci, the incubation danger zone should be considered 50° to 120°F. (10° to 49°C.). Foods which are susceptible to contamination by Staphylococcus should not be left in this temperature range for longer than 4 hr.

Proctor and Phillips (4) made studies of cooked foods experimentally inoculated with food-poisoning strains of Staphylococcus, Streptococcus, and Salmonella. These foods, which were chicken à la king, creamed salmon, beef stew, and cooked shrimp, were frozen and stored at 0°F. (−18°C.). In some of the foods at least 10 per cent of the organisms survived storage for six months.

Other investigations by Proctor and Phillips (4) on the effect of thawing on bacteria indicated that the bacterial pathogens, Staphylococcus, Streptococcus, and Salmonella, in frozen cooked foods could increase in number after storage at defrosting temperatures of 86° to 117°F. (30° to 37°C.) for 6 to 8 hr. These increases lend emphasis to the need for proper storage and thawing of all such foods. The

[1] Reported from the unpublished master's thesis of Rachel M. Ice. This is part of a larger project titled, "The Effect on Bacterial Counts of Holding, Refrigerating, and Freezing Cooked Foods Prepared in Quantity." Received for publication July 2, 1951.

authors found that at a lower thawing temperature, bacterial increase occurred less rapidly. Some increase did occur at 50°F. (10°C.) within a few days after foods were removed from 0°F. (−18°C.) storage.

Causey and Fenton (5) studied the bacteriologic flora of frozen home-cooked creamed chicken on rice, chicken paprika with gravy, spaghetti and meat balls, and ham patties before and after five methods of reheating. The initial counts were low, less than 2000 per gram in all products. Thawing at room temperature in most cases resulted in increased counts. Reheating from either the hard frozen or thawed state resulted in decreased counts. Organisms occurring were found to be of the Bacillus and Staphylococcus strains.

Hussemann (6) made observations on the bacteriologic flora of commercially frozen precooked chicken à la king, beef stew, and creamed fish as they reached the kitchen and at different stages during subsequent kitchen procedures, such as cookery and refrigeration. Although cooking reduced the number of all varieties of microorganisms, it did not eradicate any type. Continued multiplication of bacterial cells was observed in chicken à la king and beef stew under conditions of household refrigeration.

EXPERIMENTAL PROCEDURE

Preparation of Loaves

Eight meat loaves were made in each lot, and the entire experiment was repeated three times. Four of the eight loaves were used for subjective scoring, and the other four were used for sampling for bacteriologic count.

The *p*H of the fresh meat, the meat loaf mixture, and the baked meat loaf after freezing and thawing was determined.

The materials used for the preparation of the loaves were those purchased ordinarily for the Home Economics Cafeteria, Department of Institution Management, New York State College of Home Economics, Cornell University. No special effort was made to use materials from the same lot for the entire problem. Materials on hand when the work was done were used. This method introduced several variables. The kitchen equipment used for the most part was standard institutional equipment.

Since the work was to be as practical as possible, it seemed desirable to follow the recipe for meat loaves used in the Home Economics Cafeteria. Since it has been stated that spices may be altered during freezer storage (1), a preliminary study checking possible changes in onion, pepper, and salt seemed indicated.

The subjective scores for palatability indicated that the meat loaves containing the original proportion of onion, salt, and pepper were acceptable for serving after freezing, thawing, and reheating after the relatively short storage period of two weeks.

The proportion of ingredients used in the preparation of meat loaves for the entire study was as follows:

Ground beef	16 lb.
Ground pork	4 lb.
Egg whites (frozen)	18 oz.
Egg yolks (frozen)	12 oz.
Bread crumbs	2½ lb.
Chopped onions	8 oz.
Salt	4 oz.
Pepper	¼ oz.
Water	3 lb.

This quantity made eight 3½-lb. loaves. All ingredients were mixed in an electric mixer and hand-packed into the loaf pans.

Baking

All loaves were baked at an oven temperature of 350°F. (177°C.) to an internal temperature of 180°F. (82°C.). Thermocouples were placed in the center of each loaf to record the temperature at approximately 15-min. intervals.

Treatment after Baking

Four loaves were left in the loaf pans and set into pans of crushed ice to cool quickly; the internal temperature was checked at 15-min. intervals. When they reached an internal temperature of 70°F. (21°C.), the loaves were wrapped in heavy aluminum foil and frozen. About 2 hr. holding time were needed.

The other four loaves were left in the loaf pans uncovered and allowed to cool at room temperature, 77°F. (25°C.), for 5 hr. This period was chosen because it seemed likely that food might be held that long during institutional meal service and then frozen as a leftover. Jensen (3) has stated that cooked foods should not be held in a temperature range of 50° to 120°F. (10° to 49°C.) for more than 4 hr. The final internal temperature after this 5-hr. holding period was approximately 85°F. (30°C.). At the end of the 5-hr. period, the loaves were wrapped in heavy aluminum foil and frozen.

Freezing and Storage

The meat loaves were frozen at 0°F. (−18°C.). The freezing rates were recorded, using an electronic potentiometer. The loaves were stored in a walk-in freezer which was maintained at −10°F. (−24°C.). All loaves were stored for eighteen days and scored on the nineteenth day, with one exception which was scored on the twenty-first day.

Thawing

The loaves were removed from the freezer 24 hr. before they were to be scored. The loaves in their original sealed wrapping were placed on trays in the refrigerator, 34° to 36°F. (1° to 2°C.).

Holding after Thawing

After thawing at refrigerator temperature, four loaves were sliced and reheated in a 350°F. (177°C.) oven; four loaves were sliced, spread out, and exposed to room temperature for 2 hr. Two of the baked loaves in each lot had been cooled immediately before freezing, and the other two had been cooled at room temperature for 5 hr. before freezing. In each lot, one loaf from each treatment prior to freezing was used for bacteriologic samples after thawing. The other two loaves in each lot were used for subjective scoring.

Palatability

The meat loaves were scored subjectively by seven judges with one exception, when one lot of experimental loaves was scored by only four judges. The cold slices were scored after a 2-hr. holding period and the reheated slices immediately after reheating. The cold slices were scored before the reheated slices.

The loaves were scored for general acceptability for serving. The scores used were "very acceptable," "acceptable," "slightly unacceptable," and "unacceptable."

Bacteriologic Studies

Platings were made for molds, coliform organisms, and total counts.

The coliform counts were planned with the thought that the absence or presence and relative number of coliforms would serve as an indication of pollution.

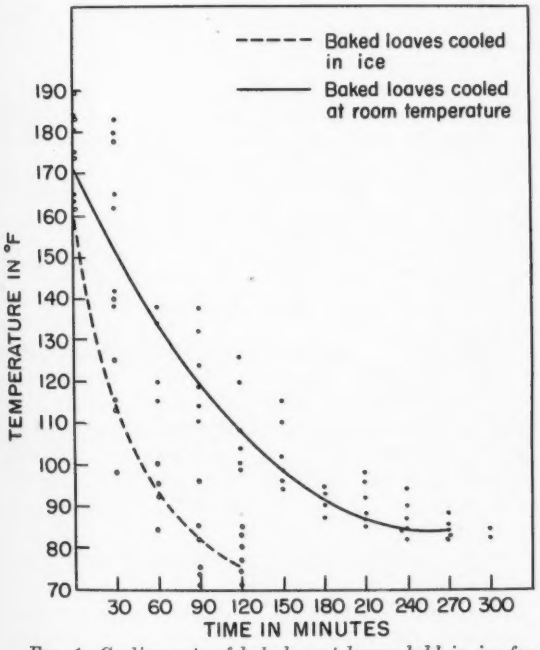

FIG. 1. *Cooling rate of baked meat loaves held in ice for 2 hr. and at room temperature for 5 hr. (three replicates).*

Platings for molds were made since there might be a possibility during the relatively long periods of holding after baking that the meat mixture might become recontaminated with molds.

It had originally been planned also to plate for micrococci. In preliminary tests, Chapman's Staphylococcus Medium 110 was used for selection of these organisms. The counts on colonies that developed on these media were, however, considered unreliable. The medium was not selective as shown by the growth of other organisms. Therefore, plating for micrococci was discontinued. It is planned to do further work in this area.

The determination of total counts was planned since they would give at least an indication of absence or presence and relative numbers of bacteria present in the meat and in the meat mixture at the various stages of preparation and processing.

Approximately 20- to 30-gm. samples were removed and then 10-gm. aliquots were taken from this amount for plating. Samples for bacteriologic analysis were taken at the same point in the procedure for each experimental loaf. To determine whether contamination came from the pan, samples were taken from the side as well as the center of each loaf. When sampling before freezing, one sample each was removed from: the beef and pork mixture alone; the side of the raw loaf; the middle of the raw loaf; the side of the baked loaf; the middle of the baked loaf; the side of the baked loaf after it had been cooled in ice, wrapped, and reopened; the middle of the baked loaf after it had been cooled in ice, wrapped, and reopened; the side of the baked loaf after it was cooled at room temperature for 5 hr., wrapped, and reopened; the middle of the baked loaf after it was cooled at room temperature for 5 hr., wrapped, and reopened.

When sampling after freezing, thawing, and slicing, one sample each was removed from the side and from

TABLE 1

*Judges' scores for meat loaves frozen at 0°F. (−18°C.) and thawed, wrapped, in the refrigerator at 34°F. (1°C.)**

METHOD OF COOLING BEFORE FREEZING	NUMBER OF JUDGMENTS			
	Very acceptable	Acceptable	Slightly unacceptable	Unacceptable
Loaves Held at Room Temperature for 2 Hr. after Thawing				
In ice	11	6	1	0
Held at room temperature for 5 hr.	13	3	2	0
Reheated after Thawing				
In ice	12	6	0	0
Held at room temperature for 5 hr.	11	7	0	0

* Three replicates.

TABLE 2

*Bacteriologic counts of meat and loaves before and after baking and cooling**

SAMPLE	AREA OF PAN SAMPLED	TOTAL COUNT PER GRAM	COLIFORM COUNT PER GRAM	MOLD COUNT PER GRAM	pH
Raw Meat					
Fresh meat					
Lot 1		660,000	Less than 1,500	1	6.6
Lot 2		465,000	Less than 1,500	0	6.5
Lot 3		137,500	Less than 1,500	1	6.0
Mean		420,833			
Meat mixture in pans					
Lot 1	Side	487,500	84,175	1	6.7
Lot 1	Middle	500,000	6,800	2	
Lot 2	Side	159,500	6,400	2	6.6
Lot 2	Middle	105,250	4,950	2	
Lot 3	Side	68,500	Less than 1,500	0	6.1
Lot 3	Middle	76,500	Less than 1,500	0	
Mean		234,541			
Baked Meat Loaves					
Immediately after baking					
Lot 1	Side	Less than 1,500	Less than 1,500	2	
Lot 1	Middle	Less than 1,500	Less than 1,500	0	
Lot 2	Side	Less than 1,500	Less than 1,500	1	
Lot 2	Middle	Less than 1,500	Less than 1,500	1	
Lot 3	Side	Less than 1,500	Less than 1,500	0	
Lot 3	Middle	Less than 1,500	Less than 1,500	0	
Cooled in ice, wrapped					
Lot 1	Side	Less than 1,500	Less than 1,500	0	
Lot 1	Middle	Less than 1,500	Less than 1,500	1	
Lot 2	Side	Less than 1,500	Less than 1,500	0	
Lot 2	Middle	Less than 1,500	Less than 1,500	1	
Lot 3	Side	Less than 1,500	Less than 1,500	0	
Lot 3	Middle	Less than 1,500	Less than 1,500	0	
Held at room temperature for 5 hr.					
Lot 1	Side	Less than 1,500	Less than 1,500	1	
Lot 1	Middle	Less than 1,500	Less than 1,500	0	
Lot 2	Side	Less than 1,500	Less than 1,500	4	
Lot 2	Middle	2,450	Less than 1,500	127	
Lot 3	Side	Less than 1,500	Less than 1,500	0	
Lot 3	Middle	Less than 1,500	Less than 1,500	0	

* Three replicates.

the middle, separately, of each of the loaves treated as follows:

1. Cooled in ice after baking, frozen, thawed, sliced, and
   a. reheated
   b. exposed to room temperature for 2 hr.
2. Cooled for 5 hr. at room temperature after baking, frozen, thawed, sliced and
   a. reheated
   b. exposed to room temperature for 2 hr.

The samples for mold counts were plated on Waksman's medium. Desoxycholate agar was used for plating coliforms. For total counts, the samples were plated on nutrient agar.

RESULTS AND DISCUSSION

When cooled immediately on ice, approximately 2 hr. were required to lower the internal temperature of the loaves from 165°F. (74°C.) to 77°F. (26°C.) (Fig. 1). The average room temperature during this period was 80°F. (27°C.). The loaves were in the dangerous temperature zone for bacterial growth as stated by Jensen (3) (50° to 120°F. [10° to 49°C.]) for a period of 1 hr. to 1 hr. 20 min.

When cooled at room temperature for 5 hr., the internal temperature of the loaves decreased from 173°F. (79°C.) to 85°F. (30°C.) (Fig. 1). The loaves were in the dangerous temperature zone for bacterial growth in cooked foods (3), for 3½ hr.

Temperature Changes after Thawing

The temperature increased in the slices of meat loaf held at room temperature for 2 hr. from an average of 37°F. (3°C.) to an average of 65°F. (19°C.). The temperature of the slices was above 50°F. (10°C.) for 80 min. of the 120-min. holding period.

When reheated in a 350°F. (177°C.) oven, approximately 45 min. were required to reach an internal temperature recording of 140° to 145°F. (60° to 63°C.) in the center of the slices of meat loaf.

Palatability

A summary of the scoring for palatability for the meat loaves is shown in Table 1. In general, the reheated meat loaves were preferred over the loaves served cold. This might be due partially to personal preferences of the judges. The differences in scoring between the loaves cooled in ice before freezing and those held for 5 hr. at room temperature before freezing were slight. The scoring seemed to indicate that the loaves treated in either manner would be acceptable for service to the public.

Bacteriologic Results

As expected, the eggs carried the highest bacterial count. The count increased at room temperature. The counts for the bread and onion were low.

The results of the analysis of the samples from the meat and meat loaves before freezing are shown in Table 2.

The total counts for the different lots of fresh meat varied, but all were below the 10,000,000 per gram, which is a permissible standard for fresh ground meat recommended by Geer, Murray, and Smith (7).

When counts of samples removed from side and middle of pans were compared, the differences in the total counts were within the range of experimental error when it is remembered that a 90 per cent error should be allowed (3).

No coliform organisms were found in the meat itself, but they were found in the meat mixture. The coliform organisms might have been introduced by the other ingredients, from the equipment used, or from the hands. Coliform counts tended to be higher for the samples from the side of the pans. This seems to indicate that the contamination stemmed from equipment rather than the hands. Tanner (8) stated that a count of *Escherichia coli* along with the total count is more valuable than the total count alone. *Escherichia coli* is an indication of pollution.

In the baked loaves, the number of bacteria per gram was below 1500 for either total count or coliform count with one exception. Also with one exception, the mold counts were between 0 and 4 per gram. The *p*H of the fresh meat and the meat loaf mixtures was similar in all three lots.

The bacteriologic results from these three lots of meat loaf indicated that baking to an internal temperature of 180°F. (82°C.) was sufficient to destroy the majority of the microorganisms.

The results of the analysis of the samples taken after the loaves were frozen, stored, thawed, and sliced are shown in Table 3.

Four samples of the loaves held at room temperature for 2 hr. gave counts of over 1500 per gram. These organisms may have been introduced in the slicing operation or in sampling. These total counts—3150, 1500, 4600, and 5050 per gram—were below

TABLE 3

Bacteriologic counts in meat loaves after thawing and slicing†*

METHOD OF COOLING BEFORE FREEZING	AREA OF PAN SAMPLED	TOTAL COUNT PER GRAM	MOLD COUNT PER GRAM	*p*H
Loaves Held at Room Temperature for 2 Hr. after Thawing				
In ice				
Lot 1	Side	Less than 1,500	0	6.9
Lot 1	Middle	Less than 1,500	1.5	
Lot 2	Side	Less than 1,500	0	
Lot 2	Middle	Less than 1,500	0	
Lot 3	Side	3,150	2	5.7
Lot 3	Middle	1,500	1	
Held at room temperature for 5 hr. before freezing				
Lot 1	Side	4,600	1	
Lot 1	Middle	Less than 1,500	0	
Lot 2	Side	Less than 1,500	0	
Lot 2	Middle	Less than 1,500	0	
Lot 3	Side	5,050	2	
Lot 3	Middle	Less than 1,500	2	
Reheated after Thawing				
In ice				
Lot 1	Side	Less than 1,500	1	
Lot 1	Middle	Less than 1,500	1	
Lot 2	Side	Less than 1,500	0	
Lot 2	Middle	Less than 1,500	0	
Lot 3	Side	Less than 1,500	0	
Lot 3	Middle	Less than 1,500	0	
Held at room temperature for 5 hr. before freezing				
Lot 1	Side	Less than 1,500	1	
Lot 1	Middle	Less than 1,500	0	
Lot 2	Side	Less than 1,500	0	
Lot 2	Middle	Less than 1,500	0	
Lot 3	Side	Less than 1,500	1	
Lot 3	Middle	Less than 1,500	1	

* No countable plates for coliform organisms found in any of the samples.

† Three replicates.

the suggested permissible standard of 10,000 to 100,000 per gram made by Fitzgerald (2).

No coliform organisms were found in the loaves after freezing, thawing, holding at room temperature for 2 hr., or after reheating. The mold counts in all the samples ranged from 0 to 2 per gram.

Since from the bacterial analysis made in this study it seems that meat loaves could be held for a period of 5 hr. before freezing without great danger of recontamination, a word of caution is in order. It should be emphasized that the bacterial counts found in the present study were probably low because: first, initial counts made of the meat and eggs were fairly low; second, the meat was handled by a scientifically trained person and extreme care was taken during all of the procedures. It cannot be assumed that the same results would occur with lay workers and in less sanitary establishments.

SUMMARY

The effect of methods of holding before and after freezing and of reheating on the palatability and bacterial plate counts of meat loaves prepared in quantity were studied.

The meat loaves were judged for palatability after reheating and after exposure to room temperature for 2 hr. The flavor of the reheated frozen meat loaves was preferred over loaves held for 2 hr. after thawing and served at room temperature. There were only slight differences in the palatability scores of the meat loaves which were cooled in ice before freezing and those cooled at room temperature for 5 hr. before freezing. The judges seemed to think that the loaves cooled at room temperature had more of a "warmed over" flavor than did the loaves cooled in ice. The scores indicated that these leftover meat loaves which had been frozen and stored for three weeks, then thawed in the refrigerator, sliced, and reheated or held at room temperature for 2 hr. were acceptable in palatability.

During thawing in a refrigerator (34° to 36°F. [1° to 2°C.]) for approximately 24 hr., the internal temperature of the meat loaves increased to 28° to 30°F. (−2° to −1°C.). After the meat loaves were sliced, spread out on trays, and exposed to room temperature for 2 hr., the internal temperature had reached approximately 70°F. (21°C.). Approximately 45 min. in a 350°F. (177°C.) oven were required to increase the internal temperature of the slices to 140° to 145°F. (60° to 63°C.).

In the baked loaves, samples plated for total counts showed less than 1500 per gram when removed immediately after baking and after cooling in ice. In samples removed from loaves which had been cooled at room temperature for 5 hr., one plating out of eight was over 1500 per gram; the count was below the permissible standard suggested by Fitzgerald (2). Contamination during sampling may be an explanation for the exception.

All samples removed from baked loaves gave platings of less than 1500 per gram for coliforms. The mold counts ranged from 0 to 4 per gram. There was no apparent difference in the counts of the samples from the side and the middle of the pans.

With four exceptions, platings for total counts from samples removed from meat loaves after freezer-storage, thawing, and slicing were lower than 1500 per gram. The four exceptions were platings from samples removed from loaves which had been held at room temperature for 2 hr., after thawing; three of these came from the side of the loaf. All four plates had counts below the suggested permissible standard (2) for frozen cooked foods.

Counts for coliform organisms from any of the samples removed at this time were less than 1500 per gram. The mold counts were low, ranging from 0 per gram to 2 per gram.

Under average conditions for large-scale food preparation long holding periods such as were used in this study are probably not safe.

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Trichinae Travel from Rats to Swine

Trichinae—the parasite causing trichinosis in swine and in man when he eats infected pork—have been found to attack pigs through feed contaminated with the droppings of infected rats. Rats commonly infest hog lots and garbage-feeding establishments; therefore, these excreta may be a serious source of trichinae in swine.

A survey to determine incidence of trichinae in swine indicated less than 1 per cent of farm-raised hogs in the Middle West to be infected, whereas on the eastern seaboard 9 per cent of hogs known to be fed on garbage contained the parasites.—*From Report of the Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, 1951.*

B-Complex Vitamins in Meat

IV. Influence of Storage Time and Temperature on the Vitamins in Pork Roasts[1]

BEULAH D. WESTERMAN, Ph.D., GLADYS E. VAIL, Ph.D., JUNE KALEN, MIRIAM STONE, and D. L. MACKINTOSH[2]

Departments of Foods and Nutrition and Animal Husbandry, Kansas Agricultural Experiment Station, Kansas State College, Manhattan

MEAT plays a vital role in the human dietary and has become the center of the balanced meal. The nutritive value of meat, as it is served on the dinner table, depends a great deal upon the treatment it receives before reaching the table. One of the important methods used for the preservation of meat is freezing. Storage time and temperature may affect the meat in such a manner as to render the vitamins more susceptible to losses during cooking.

Several investigators have reported losses of B vitamins in pork after cooking. A review of the literature through 1946 is given in a previous publication by Vail and Westerman (1). Erikson and Boyden (2) reported that average percentage losses due to cooking by boiling, roasting, or frying were above 50 per cent for thiamine and niacin, and above 35 per cent for riboflavin. In some instances, however, there was actually more riboflavin in the cooked than in the raw meat. When the heating process was longer, as in the canning of pork, the riboflavin increased 14 to 48 per cent over that in the raw sample, while the losses in thiamine ranged from 72 to 82 per cent. Hartzler, Ross, and Willett (3) reported a percentage retention of 59, 101, and 75 for thiamine, riboflavin, and niacin, respectively in roasted pork loins. They also found that storage of the samples of ground pork at −5° to −10°F. for five to nine months resulted in no loss of riboflavin or niacin and little or no loss of thiamine.

Causey *et al.* (4) studied the vitamin losses in ground pork patties and loaves after different methods of cooking and found that the retention of thiamine in the patties averaged 85 per cent and in the loaves 63 per cent; of riboflavin, 96 per cent in the patties and 85 per cent in the loaves; of niacin, 97 per cent in the patties and 95 per cent in the loaves. Cover and co-workers (5) found a total retention of 81, 90, 95, and 92 per cent for thiamine, pantothenic acid, niacin, and riboflavin, respectively, when pork loins were roasted at a low temperature of 302°F. until the internal temperature reached 183°F. Roasts cooked at a higher temperature of 450°F. to an internal temperature of 209°F. retained only 54, 63, 67, and 69 per cent respectively of these vitamins.

Few data are available correlating storage temperature and time with cooking losses. It is possible that these factors have a relationship to the loss of the B vitamins during cooking. The experiments reported in this paper were designed to determine the effect of these factors upon the amounts of thiamine, riboflavin, pantothenic acid, and niacin retained in roasted pork loins.

METHOD OF PROCEDURE

The pork loins from eighteen hogs were used in the experiments. The methods of cutting and wrapping the loins were described in a previous paper by Westerman *et al.* (6). Two of the fresh pork loins from each animal were saved; one was analyzed in the raw state immediately, and the other was roasted and then analyzed for vitamin content. The frozen loins in Experiment *I* were stored at 10°, 0°, and −10°F. for 12, 24, 40, 56, and 72 weeks, while those in Experiment *II* were stored at 0°, −10°, and −20°F. for 12, 24, 36, and 48 weeks and at 0° and −10°F. for 60 and 72 weeks.

After the various frozen storage periods, the loins were removed from storage and divided into halves. One-half was used for the raw sample, and the other

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TABLE 1

*Experiment I—percentage retention of vitamins in cooked pork loins**

ANIMAL	STORAGE TEMPERATURE	THIAMINE RETENTION	PANTOTHENIC ACID RETENTION	NIACIN RETENTION
		No Storage		
	°F.	%	%	%
1		58.2	144.2	59.7
2		53.0	122.5	72.3
3		50.2	130.8	68.0
4		63.0	90.9	81.9
5		61.7	104.6	73.9
6		63.9	141.5	60.0
7		53.1	71.1	55.8
8		70.7	73.2	71.6
9		58.6	66.7	57.5
		12 Weeks' Storage		
7	10	75.4	70.5	56.6
8	10	64.8	120.9	54.4
9	10	57.4	80.5	47.5
7	0	58.8	61.0	57.0
8	0	73.0	124.7	74.2
9	0	59.0	81.0	53.6
7	−10	79.2	92.9	63.0
8	−10	48.3	119.2	71.7
9	−10	51.8	94.3	55.7
		24 Weeks' Storage		
4	10	66.0	85.9	82.8
5	10	64.3	93.2	96.5
6	10	64.9	125.8	110.4
7	0	99.4	72.0	78.9
8	0	82.8	86.7	69.1
9	0	64.9	86.1	56.7
7	−10	66.4	60.6	73.8
8	−10	70.4	63.8	61.6
9	−10	66.6	57.9	60.5
		40 Weeks' Storage		
4	10	50.9	89.1	73.7
5	10	67.1	90.4	66.8
6	10	63.4	93.6	65.3
4	0	49.9	102.7	74.9
5	0	66.3	124.1	74.9
6	0	68.1	110.8	73.6
4	−10	53.9	62.0	45.4
5	−10	71.6	102.0	85.3
6	−10	57.6	125.3	85.7

TABLE 1—*Continued*

ANIMAL	STORAGE TEMPERATURE	THIAMINE RETENTION	PANTOTHENIC ACID RETENTION	NIACIN RETENTION
		56 Weeks' Storage		
	°F.	%	%	%
1	10	73.2	84.4	80.6
2	10	64.2	67.0	82.0
3	10	82.1	78.2	66.2
1	0	44.5	89.8	93.6
2	0	73.7	86.4	80.1
3	0	54.4	101.6	62.9
4	−10	66.6	83.0	71.2
5	−10	89.2	72.4	88.5
6	−10	67.7	75.0	96.6
		72 Weeks' Storage		
1	10	76.5	84.1	74.8
2	10	77.8	86.7	97.6
3	10	43.4	92.4	74.5
1	0	69.4	74.3	62.8
2	0	67.5	83.9	57.6
3	0	79.2	74.3	48.8
1	−10	68.4	86.6	69.6
2	−10	80.9	104.7	77.9
3	−10	65.0	85.9	62.3

* Data calculated on a dry, fat-free basis.

half was roasted in a 350°F. oven to an internal temperature of 185°F. The preparation of the samples and the methods of analyses have been described previously (6). In order to have comparable data, results are reported on a dry, fat-free basis.

RESULTS AND DISCUSSION

Thiamine

The percentage retention of the vitamins in the roasted pork loins is shown in Table 1 for Experiment *I* and in Table 2 for Experiment *II*. It may be noted that the retention of thiamine after cooking averaged 59 per cent for the nine fresh pork loins in Experiment *I* and 60 per cent in Experiment *II*. Similar losses have been reported by other investigators. Brady, Peterson, and Shaw (7) reported a 20 to 30 per cent loss of this vitamin from rib-eye muscles after cooking. Hartzler, Ross, and Willett (3) found that 59 per cent of the thiamine was retained in loin cuts after roasting, and Vail and Westerman (1) showed that 57 per cent was retained.

The average retention of the thiamine in the cooked meat after 12 weeks' storage was fairly constant—65.9 per cent at 10°F., 64 per cent at 0°F. in both experiments, and 59.8 per cent at −10°F. in the first experiment and 65.7 per cent in the second.

TABLE 2

*Experiment II—percentage retention of vitamins in cooked pork loins**

ANIMAL	STORAGE TEMPERATURE	THIAMINE RETENTION	RIBOFLAVIN RETENTION	PANTOTHENIC ACID RETENTION	NIACIN RETENTION
		No Storage			
	°F.	%	%	%	%
1		94.7	158.7	101.0	81.4
2		65.1	145.6	120.8	65.8
3		45.9	149.9	102.8	76.8
4		61.5	101.0	86.2	57.0
5		51.8	81.2	72.7	60.8
6		46.6	140.5	85.8	58.8
7		78.6	163.8	82.5	91.8
8		48.5	83.7	82.9	66.0
9		48.2	137.4	121.5	129.0
		12 Weeks' Storage			
7	0	78.5	85.9	71.2	83.7
8	0	58.5	44.3	74.0	88.8
9	0	55.7	70.8	84.6	78.2
7	−10	67.1	87.4	94.7	81.2
8	−10	60.3	85.0	85.0	73.4
9	−10	69.8	74.1	103.4	66.1
7	−20	77.7	82.8	95.6	88.9
8	−20	75.5	56.4	79.3	84.6
9	−20	67.0	86.4	101.5	72.3
		24 Weeks' Storage			
7	0	76.1	61.7	71.2	98.4
8	0	75.3	64.0	83.7	72.7
9	0	73.1	68.2	76.7	58.8
7	−10	79.4	85.9	85.3	79.5
8	−10	61.1	80.2	76.9	77.1
9	−10	54.6	83.3	82.7	87.8
7	−20	79.5	115.4	105.5	81.1
8	−20	71.2	78.1	83.1	70.7
9	−20	53.2	94.8	100.9	73.8
		36 Weeks' Storage			
4	0	73.7	59.4	63.5	69.5
5	0	55.2	56.8	68.6	83.4
6	0	59.8	89.7	78.4	81.7
4	−10	71.9	84.0	72.9	70.9
5	−10	63.6	93.6	77.4	83.9
6	−10	75.1	81.1	79.6	93.4
4	−20	71.2	86.3	71.5	68.3
5	−20	89.3	71.4	81.5	73.7
6	−20	71.1	84.6	67.8	70.8

TABLE 2—*Continued*

ANIMAL	STORAGE TEMPERATURE	THIAMINE RETENTION	RIBOFLAVIN RETENTION	PANTOTHENIC ACID RETENTION	NIACIN RETENTION
		48 Weeks' Storage			
	°F.	%	%	%	%
4	0	78.4	80.5	85.9	72.3
5	0	78.8	58.3	65.8	69.0
6	0	53.6	68.9	87.6	63.6
4	−10	64.5	87.0	81.6	66.5
5	−10	54.9	83.2	94.4	79.4
6	−10	67.4	98.4	78.3	75.2
4	−20	56.3	90.5	71.8	61.6
5	−20	87.5	63.4	71.1	74.5
6	−20	80.2	82.5	74.5	71.9
		60 Weeks' Storage			
1	0	74.5	103.8	87.7	73.6
2	0	63.0	94.2	96.9	64.5
3	0	76.0	69.3	71.3	53.7
1	−10	109.8	91.4	93.9	68.8
2	−10	60.5	94.6	98.8	67.6
3	−10	52.2	111.6	83.6	70.3
		72 Weeks' Storage			
1	0	96.7	99.0	81.5	91.8
2	0	58.6	80.9	84.7	66.8
3	0	64.2	85.8	81.4	97.8
1	−10	70.3	92.6	90.8	83.1
2	−10	62.7	75.2	83.3	80.3
3	−10	73.2	78.1	84.3	84.9

* Data calculated on a dry, fat-free basis.

However, after storage at −20°F., 73.4 per cent of the thiamine was retained. Loins stored 24 weeks at 10°F. retained 65 per cent of the thiamine after cooking. In both experiments the highest retention of this vitamin in the loins stored for 24 weeks occurred in the samples kept at 0°F.

After 36 weeks' storage (Table 2), the greatest average retention was in the loins stored at −20°F.—77.2 per cent. Again the retention of thiamine in the cooked loins after 48 weeks' storage was greatest in those samples stored at −20°F. The samples stored at −10°F. for the longer periods of 56 (Table 1), 60, or 72 weeks (Table 2) showed a greater retention than those stored at 10° (Table 1) or 0°F. Samples stored at −20°F. for these periods were not available. No statistically significant differences in the thiamine content of the cooked meat due to storage temperatures and time were shown by the analyses of variance (Tables 3 and 4). The thiamine losses due to cooking were greater than those due to storage. Westerman *et al.* (6) found a fairly good retention of thiamine in the raw loins stored under

TABLE 3

Analysis of variance of figures in Table 1

SOURCE OF VARIATION	DEGREES OF FREEDOM	MEAN SQUARE		
		Thiamine	Pantothenic acid	Niacin
Storage temperature	2	6.659	100.6	203.4
Storage time	4	188.493	591.0*	574.5
Storage temperature × storage time	8	146.069	527.9	345.3*
Animals	30	130.013	266.9	126.8
Total	44			

* Significant at 5% level.

the same conditions. The greatest loss of this vitamin, 30 per cent, occurred in those raw samples stored at 10°F. for 56 weeks.

Riboflavin

The riboflavin values are reported only for the loins analyzed in Experiment *II* (Table 2). The samples that were cooked without a storage period showed an increase in riboflavin content. Hinman and co-workers (8) have obtained similar results on beef, and Hartzler, Ross, and Willett (3) reported 101 per cent retention of riboflavin in pork loin cuts after roasting. The storage temperatures appeared to influence the retention of this vitamin in the cooked meat. This factor was shown to be statistically significant by an analysis of variance. Storage at 0°F. allowed a greater loss of this vitamin during all storage periods than storage at −10° or −20°F. An analysis of means for four storage periods and three temperatures showed a significant difference in the retention of this vitamin stored at 0°F. and at −10°F. or −20°F. When the analysis of mean was applied to six storage periods and two temperatures, again there was a significant difference in the amount retained in the loins stored at 0°F. and −10°F. There was greater retention of riboflavin in the cooked meat when the meat had been stored at temperatures of −10°F. or below regardless of whether the storage period had been long or short. In a previous paper, Westerman *et al.* (6) have shown that, except for a few samples, the losses of this vitamin from the raw meat during storage were small for all storage temperatures and periods.

Pantothenic Acid

More pantothenic acid than thiamine or niacin was retained in the fresh meat after roasting (Tables 1 and 2). The variation in percentage retention among the different animals was high, and the cooked meat from Animals *1*, *2*, and *3* in both experiments showed an increase in pantothenic acid rather than a loss without storage. It is interesting to note in the first experiment that after 12 weeks' storage,

TABLE 4

Analyses of variance of figures in Table 2

SOURCE OF VARIATION	DEGREES OF FREEDOM	MEAN SQUARES			
		Thiamine	Riboflavin	Pantothenic acid	Niacin
Analysis for 12, 24, 36, and 48 Weeks' Storage at 3 Temperatures					
Storage temperature	2	177.71	1123.94**	263.07*	38.20
Storage time	3	8.14	65.81	366.57**	146.48
Storage temperature × storage time	6	89.94	116.83	156.81	70.34
Animals	24	109.55	162.92	67.33	76.98
Total	35				
Analysis for All 6 Storage Periods at 0° and −10° F.					
Storage temperature	1	331.24	3045.2***	3220.56***	380.2
Storage time	5	365.26	2001.2**	1113.41***	2083.3***
Storage temperature × storage time	5	97.37	171.7	39.61	192.2
Animals	24	304.69	366.1	95.23	264.2
Total	35				

* Significant at 5% level.
** Significant at 1% level.
*** Significant at 0.1% level.

all samples from Animal *8* showed an increase in pantothenic acid and the percentage retention in these samples was approximately the same, 120 per cent. This would appear to be due to animal variation, since the other pork loins lost pantothenic acid during storage and cooking.

The analyses of variance for pantothenic acid (Tables 3 and 4) showed that the storage time was significant at the 5 per cent level in Experiment *I* and at the 1 per cent level in Experiment *II*. The effect of storage temperatures was shown to be significant in Experiment *II*. An analysis of means for four storage periods and three temperatures showed a greater retention in the loins after storage at −10°F. and −20°F. There is some indication that storage at the lower temperatures aids in retaining this vitamin.

Niacin

The losses of niacin, like those of thiamine, were high. The average retention of niacin in the cooked loins without storage was 66.7 per cent and 69.8 per cent in the two experiments (Tables 1 and 2). The value for Animal *9*, which was abnormally high, was omitted in figuring these averages. These values are somewhat lower than the 75 per cent retention of this vitamin reported by Hartzler, Ross, and Wil-

lett (3). It may be noted in Table 1 that storage at 10°F. for 12 and 40 weeks brought about greater losses in the cooked meat than storage at the lower temperatures of 0° and −10°F. The statistical analysis indicated that the interaction between the storage temperatures and time was significant for this vitamin.

The percentage retention of niacin in the pork loins in Experiment *II* is shown in Table 2. The analysis of variance on samples stored at 0° and −10°F. for the six storage periods showed significant differences among the storage periods (Table 4). There was less retention of this vitamin after cooking in the loins which had been stored for 48 and 60 weeks at 0°F. Storage temperatures of 0°F. or below promoted retention of this vitamin during the other storage periods. A previous study (6) has shown that little or no loss of this vitamin occurred in the raw meat during frozen storage.

The effect of storage temperatures on the palatability of pork fat and lean, the peroxide numbers, and free fatty acids have been reported for these same animals by Hall *et al.* (9). The results showed that loins stored at −10°F. and −20°F. had less peroxide, less free fatty acid, and higher palatability than those kept at higher temperatures.

SUMMARY

Results have been reported on the influence of storage time and temperatures on the amount of thiamine, riboflavin, pantothenic acid, and niacin retained in pork loins after roasting. Thiamine and niacin showed the greatest losses. There were some indications that storage at −20°F. aided somewhat in the retention of thiamine in the roasted pork, but an analysis of variance showed no statistically significant differences in the thiamine content of the cooked meat which could be attributed to storage temperatures and time.

The storage temperature influenced the retention of riboflavin in the cooked meat more than the storage time. Greater retention was observed in the loins stored at −10°F. or below. The losses of riboflavin and pantothenic acid were not large for any of the storage periods or temperatures.

The losses of niacin were rather high. There was some indication that storage at 0°F. and below for the longer storage periods aided in the retention of this vitamin in the cooked meat. The data for all the vitamins showed considerable variation, and no definite conclusions can be drawn.

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Cortisone and Appetite

A study at Brooke Army Hospital made on two four-year-old boys with rheumatoid arthritis and one boy, aged eleven, with biliary cirrhosis and pancreatic fibrosis, showed that caloric intake may be four or five times the normal requirement when cortisone is given under a free-dietary-intake plan. For example, one of the four-year-old boys had a basal caloric requirement of 800 calories per 24 hr. Under cortisone treatment, his intake jumped from 1671 to 3752 calories for the same period.

Cortisone, it is found, is antianabolic, but this effect is neutralized by the increased intake of calories, nitrogen, and electrolytes when therapy is continued for as long as ten days. In such circumstances, approximately one-half the weight gain produced is due to nitrogen retention and actual nutritional gain. Undesirable excess weight gain and edema may be reduced by use of a salt-free diet.

If the dietary intake is adequate, additional potassium is not required to prevent hypokalemia and potassium deficit, but its use may facilitate nitrogen assimilation.—*Abstracted from Geppert, L. J., O'Hara, B. F., and Peat, A. C.: The effect of cortisone on nutrition. J. Pediat. 39: 267, 1951.*

Current Comment

WHAT DO YE MORE THAN OTHERS?[1]

R. ALBERTA HUGHES[2]

Chairman, Project on "Study of Delegation of the Dietitian's Duties," Food Administration Section, The American Dietetic Association

What do ye more than others? What are the duties that only the dietitian can do?

We have become so valuable in ever-increasing areas of work that there are not enough dietitians to go around. At present, many institutional positions of responsibility are being filled with persons inadequately prepared for them. These institutions have not been able to obtain qualified dietitians, although the salary and working conditions are adequate. Such a situation can only result in the lowering of the standards in dietetic service.

What can we do to meet our responsibilities and fill these opportunities? Let us make use of these capable people but place them under the supervision of a dietitian and assign them responsibilities equal to their ability. If each hospital with at least one dietitian would train a nonprofessional assistant to take over certain of the dietitian's duties, in a few years there should be enough dietitians for most of the hospitals which are now without them.

Many of you are familiar with the significant though controversial book, *Nursing for the Future* written by Esther L. Brown as a result of her survey of fifty schools of nursing. In addition to this survey, three regional workshops were planned by the National Nursing Council. San Francisco, Chicago, and Washington were the cities in which they were held. From 1250 schools of nursing invited to these workshops, more than 1000 persons attended. This yielded a body of opinion from all sections of the country. The survey and the workshops represent two ways in which the nursing profession is studying how "the existent supply [of nurses can] be utilized more advantageously and distributed more equitably" (1).

In a more limited way the members of The American Dietetic Association have been examining their duties through local group discussions and workshops stimulated by Project I of the Food Administration Section, the "Delegation of the Dietitian's Duties." We do not know how widespread the participation in this project has been, because the number attending has not been reported in every case.

In this connection we need also to examine the report of the field study made by Prall *et al.* (2) of the working schedules of dietitians in seventeen hospitals of 100 to 300 beds.

The responsibilities of a dietary department are often classified as administrative, therapeutic, and educational. Let us look at them objectively, keeping in mind that the dietitian has established herself as a recognized member of the medical team and also as an expert in scientific food management. A few years ago Dr. Hilda Taba told the directors of approved dietetic internships that they must forget their "sacred cows" in planning the curriculum. Her suggestion was to approach the problem from the viewpoint of needs and objectives rather than from precedent.

That appears to be a good suggestion for all dietitians. Even though we are a young profession, we have developed some "sacred cows" as a group and as individuals.

ADMINISTRATIVE RESPONSIBILITIES

Many of you are responsible for the entire purchasing procedure of your department. This, of course, indicates your business ability. You obtain quotations on food supplies according to specifications; place the order; receive the deliveries, checking carefully as to quality and quantity; make the necessary purchasing and receiving records; properly store and issue supplies; and keep accurate inventories. What do ye more than others? Do not the purchasing agent and storeroom clerk do the same? When well trained, they do it even better as they are not distracted by a "hundred" other responsibilities.

We no longer need to prove that we can do as good a job or better than purchasing agents. Let us work cooperatively with them and patiently teach them (sometimes with subtlety) our needs and standards. Better still, train a purchasing clerk to do all the routine procedures under your supervision.

Prall *et al.* (2) found in some cases that dietitians were the sole keepers of the keys, although the storage space was some distance from their offices. Do you suppose that they were the only honest persons in their departments?

In the area of food production, you requisition food and supplies, give specific instructions for the preparation of each item on the menu, write out the work sheets, and perform many other routine duties which a well-trained kitchen manager or chief cook and clerk could do.

[1] Presented at the 34th Annual Meeting of The American Dietetic Association in Cleveland, on October 9, 1951.

[2] From Veterans Administration Medical Teaching Group, Kennedy Hospital, Memphis, Tennessee.

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Niacin	0.2 mg.	6.4 mg.
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*Eggnog nutritive values from Bowes, A. de P., and Church, C. F.: Food Values of Portions Commonly Used, ed. 7, Philadelphia, College Offset Press, 1951.

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If food service is under your supervision, you carefully check each item of food placed on the ward food conveyors and check each tray as it is served, previously having recorded accurately on a work sheet each patient's desires from the selective menu sheets. What do ye more than others? Does not a well-trained supervisor do the same?

Because you need good employees, you interview all applicants in order not to miss a good one. You keep employees' time records and pass out their paychecks. You keep neat records of meal census, food costs, and so forth. Does not a well-trained secretary do the same?

What does the administrative dietitian do which only she can do? She keeps all the controls under her thumb: quality control for high food standards; cost control for economical operations; policy control for a coordinated, happy working force; and organizational control for efficient operation. With routine duties delegated to well-trained nonprofessional personnel, she has time for supervision and planning which is necessary for superior food service.

THERAPEUTIC RESPONSIBILITIES

Prall *et al.* (2) noted: "responsibilities assumed by the therapeutic dietitian in hospitals of less than 250 beds seldom compared with the responsibility carried by the head dietitian."

I wonder if the therapeutic responsibilities are not of equal importance with administrative responsibilities. In reality these are duties for which *only* the dietitian is prepared: interpretation of the diet order, consultation with physicians, interviewing and instruction of patients, and clinical research. This is the person who is making the daily professional contacts for the department. To doctors, nurses, and patients, she represents all dietitians.

In cases where there is only one dietitian, there is a tendency to delegate the therapeutic duties. Is this a wise delegation? The assistance which can be given by a nonprofessional person in therapeutic duties is mainly clerical, such as typing diets, summarizing dietary orders, recording dietary changes, and making appointments for dietary instruction.

EDUCATIONAL RESPONSIBILITIES

All will agree that the teaching of student nurses, dietetic interns, medical and dental students, and patients should not be delegated to a nonprofessional person.

MacEachern (3) points out that there are "two functions which are sometimes neglected in the pressure of daily duties. These are: educational duties and research. It is mainly upon the dietitian's success in performing these two functions that she will assure as great advances in her profession in the next quarter century as have been seen in the past twenty-five years." This is a challenge to every dietitian. No matter what the dietitian's specialty, she has an obligation to advance the profession for the good of society. She does this primarily by teaching and research. Research is nothing to be feared. It has been said that anyone who has an alert, inquiring mind and a notebook can carry on research.

The teaching of professional groups and patients is the dietitian's responsibility, but what about employee training? Many aspects of employee training can very well be handled by a supervisor who is a good teacher and is well trained in your standards as well as the technical procedures.

CRITERIA FOR DELEGATION

What might be criteria for the delegation of duties? Basing the criteria for delegation on our needs and objectives would seem to be sound. The needs will vary from dietitian to dietitian, depending upon such factors as: the policies of the institution, the layout of the department, the ability of the dietitian, and the quality of nonprofessional personnel available.

The objectives are more clear. As members of The American Dietetic Association, we have stated our objectives in our constitution: "to improve the nutritional status of human beings; to raise the standards in dietetic service; to protect the status of the profession; and to foster cooperation between the members and workers in allied fields." A sound delegation of duties fosters each of these objectives. A wise dietitian will herself perform such duties as those concerned with improving the nutritional status of human beings: menu planning; instruction in normal and modified diets; and research. The standards of dietetic service will be raised when the dietitian uses the proper proportion of her day in planning and organization. An efficient dietary service, supervised by alert, enthusiastic, well-informed dietitians will be an aid to the status of the profession. When the mind is not fogged by frustration because of uncompleted tasks, it is easy to cooperate with others and to make your contribution to patient care.

Keeping the objectives in mind, a few principles for the delegation of duties might be:

(a) The dietitian alone is prepared to discuss diets with patients and physicians.

(b) The dietitian can best make the contacts with the administrative officials of the institutions as she must acquaint them with her needs and objectives.

(c) To maintain high standards and raise the standards of dietetic service, the dietitian must be in complete charge of the department.

(d) The dietitian must have time for planning and the teaching of assistants.

(e) The department should be organized so that the number of persons reporting to each dietitian is limited to the number she can adequately supervise.

(f) Assistant dietitians as well as chief dietitians have duties which can be performed by nonprofessional supervisors.

For your food file— interesting facts on canned sweet peppers

Canned Sweet Peppers

Nutritive Values of 38 grams Serving

Nutrient	Quantity of Nutrient Per Serving	Approximate Percentage of Daily Recommended Allowance†*	Approximate Percentage of Minimum Daily Requirement**
Carbohydrate (available) (1)	2.3 gm.	—	—
Fat (1)	0.14 gm.	—	—
Protein (1)	0.3 gm.	0	—
Caloric Value (1)	11 calories	0	—
Calcium (1)	3.0 mg.	0	0
Phosphorus (1)	7.2 mg.	—	1
Iron (1)	0.68 mg.	6	7
Vitamin A (3)	1300 I. U.	25	32
Thiamine (3)	0.015 mg.	1	2
Riboflavin (2)	0.031 mg.	2	2
Niacin (2)	0.27 mg.	2	—
Vitamin C (3)	45 mg.	60	150

†Limited number of samples. *Percentage based on Recommended Daily Allowance for physically active man—National Research Council. **Percentage based on Minimum Daily Requirement for adult over 12 years of age—Food and Drug Administration.

1. Food Research 11, 391 (1946) 2. J. Am. Dietet. Assoc. 21, 357 (1945)
3. J. Am. Dietet. Assoc. 23, 226 (1947)

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(g) Selection of a suitable person is paramount for success in using a nonprofessional supervisor.

(h) At present, the nonprofessional supervisor in most cases must be trained by the institution before delegation of duties is made.

SUGGESTIONS ON HOW TO BEGIN DELEGATION

If you have a vacancy for a dietitian which you have been unable to fill, consider the following steps in preparing for the use of nonprofessional supervision.

(a) Review your organization chart with the aim of relieving dietitians of routine duties and redistributing duties of the vacant position to other staff dietitians.

(b) List nonprofessional duties under two headings: clerical and secretarial, and management and supervisory.

(c) Determine number of positions needed.

(d) Write job descriptions for each employee.

(e) Carefully select the individual to fill each position.

(f) Patiently train the individual selected.

You will say, "Filling the vacancy isn't as simple as that." I agree. Each step may be a long process. Unless you have a personnel technician available who can do an evaluation of all the jobs in the department for you, I would start with one position. For example: write a job description for a clerical position. Employ and train this person. Then proceed one by one to the other positions.

PITFALLS IN DELEGATION

It appears that a sizable number of people have the idea that an executive delegates all jobs except those requiring desk work. For example, I have heard of a dietitian who assigned the daily patient contacts to a food supervisor. This dietitian sat at her desk and summarized the menu selections made by the patients after the supervisor brought them to her. Wouldn't it be more appropriate to reverse their duties? A dietitian tied to a desk is ineffective.

Another pitfall is the tendency to hire an untrained person and assign to her all of the duties formerly performed by a dietitian. This is expecting a performance which she is not prepared to give. There needs to be a redistribution of duties according to ability, education, and training.

If all the persons concerned with the change in organization are not oriented to the purpose of the change, the whole program may temporarily fail. It is often not easy to convince your assistant or your chief that a nonprofessional person could do the duties in question. I understand that many hospital administrators are not oriented to the fact that their dietitians are highly trained nutrition and administrative specialists who should not be burdened with routine duties. The American Hospital Association through its publications and institutes informs the administrators of the functions of the dietitian, but much of their appreciation of the dietitian's position will depend on the individual dietitian's presenting her particular needs to her administrator.

THE DIETITIAN PRACTICES HER PROFESSION

Released of some of her traditional duties, how does the dietitian practice her profession?

As director of the department, she is responsible for departmental organization and control, reporting directly to the administrator of the organization. As MacEachern (3) expresses it, she "is in a strategic place to speed the progress of the science of nutrition." With duties wisely delegated, she will not only have the time but also the inclination to make a systematic effort to keep abreast of the times and initiate the application of new knowledge.

As an administrative assistant, she will be responsible for (a) improving the nutritional status of human beings through meals planned, prepared, and served according to the *latest* nutritional standards; and (b) the raising and maintenance of standards in: quality of food produced and served; economical use of labor and food; training an efficient and happy working force; and contributing to the over-all planning, drawing on the knowledge of her specialty.

As a therapeutic assistant, she will (a) improve the status of human beings by: instructing the patient, seeing that "adequate amounts of the respective nutrients reach the patients' stomachs" (4), and pursuing clinical research; and (b) cooperate in the care of the patient by consulting with the doctors, nurses, and social workers.

As an educational assistant, the dietitian will advance the cause of better nutrition for all by using the best motivating and learning techniques in presenting nutrition to student nurses, medical students, graduate professional groups, and the public. She also has the obligation to do research and keep her knowledge up to date.

In conclusion, I take liberties with a quotation from Brown (1) by supplying the word *dietitians* where she has *nurses:* "Within a democratic society, there is no person, group of persons, or organized voluntary body that has power to order sudden and drastic change. Such changes as are effected will result from long and careful planning at the conference table of national, state, and local . . . associations and other bodies . . . More importantly, they will issue from the persistent and courageous efforts of hundreds of [dietitians] working within their own [hospitals] and communities."

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Infancy is characterized by rapid growth, with its important demands for foods of high nutritive quality. One such food is poultry meat. Suitably prepared, it can supplement the infant's intake of protein by supplying generous amounts of essential amino acids.[1] The high quality of this protein makes poultry meat an important and useful food from earliest infancy.

Protein and other nutrient contributions of poultry meat are charted below for easy reference.

FOOD VALUES IN 100 GRAM PORTIONS OF CHICKEN[2]

(About 3½ ounces of raw broiler meat)

Calories	151	P	200 mg
Protein	20.2 gm	Thiamine	.08 mg
Fat	7.2 gm	Riboflavin	.16 mg
Ca	14 gm	Niacine	10.2 mg
Fe	1.5 mg		

ACCEPTED — COUNCIL ON FOODS AND NUTRITION — AMERICAN MEDICAL ASSOCIATION

This seal signifies that the Council on Foods and Nutrition of the American Medical Association has reviewed and accepted the nutritional information included here, and in the supplemental material offered.

[1] Block, R. J. and Bolling, D.—The Amino Acid Composition of Proteins and Foods, 2nd Edition, C. C. Thomas, Springfield, Ill., 1951

[2] Food Values of Portions Commonly Used, Bowes and Church, 7th Edition, 1951

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emergency. 3. Need for training auxiliary workers to relieve the dietitian. Report of the Advisory Committee on Field Studies, American Hospital Association. J. Am. Dietet. A. 27:638, 1951.
(3) MacEachern, M. T.: Advances in dietetics from the hospital viewpoint. Proper foods now rank as prime therapeutic aid in medical practice. J. Am. Dietet. A. 25: 494, 1949.
(4) Duncan, G. G.: Some nutritional hazards of the hospitalized patient. J. Am. Dietet. A. 25:330, 1949.

The Dietitian in Early Times

In the September 1928 issue of the Journal of the Outdoor Life, *the dietitian's historical predecessors are described by F. G. Smith, M. D., then Assistant Surgeon General, U.S. Public Health Service, as follows:*

The dietitian has been with us from very early times. She has been known by many different names, but her place has always been exalted. The Greeks called her the tenth Muse, Gasteria, who presided over the enjoyments of tastes. They visioned her as a beautiful maid dancing beside a flowing stream in an Attic grove. Even Pan may have been a dietitian, because he is reputed to have taught mortals the art of making bread. The King of the Feast or *dictator*, whom the Greeks and Romans elected to preside over great banquets, and whom guests must obey, was a forerunner.

The duties which she now performs have been the pastime and accomplishments of kings. Achilles and Patroclus prepared the banquet in the Odyssean theme. Louis XIII of France, as well as Louis XV and Napoleon I, were skilled in the art. Philosophers and sages have essayed the role. Cadmus, who taught Greece the use of letters, had been a cook to the King of Sidon. Apicius was a great culinary chemist. It was he who, having expended immense treasures in inventing new dishes, killed himself because of lack of funds to carry out his researches.

Some of the first families of Rome must have been closely associated with the art, since Fabius means beans, and Cicero peas, and Lentulus lentils. Louis XVIII used to closet himself with his cook, whom he had made a duke, and sometimes kept the councils of state waiting while they deliberated on new dishes for the royal table. We should not forget the Emperor Verus' pie, nor Cato's cake. Nero is said to have introduced ice houses into Rome, although it is recorded that the ice from Nero's ice houses was not cold enough for the highest purposes so the epicures brought good, cold ice from the summit of the Alps for high occasions. Saint Berlanda, who was disinherited because she insisted on washing the family drinking cup before she used it herself, must have had some of the best instincts of a dietitian —her father was said to be a leper. Even Sardanapalus, the last Assyrian king, offered a thousand pieces of gold for a new dish, and Roman Anthony conferred a city of 35,000 inhabitants upon his cook as a reward of merit. Henry VIII, who was a connoisseur chiefly in other things, rewarded his chef's new pudding by conferring a manor upon him.

THE ROMAN FEAST

The best counterpart of the modern dietitian is seen in the *procurator*, or *major domo*, who presided in the heyday of Rome's afterglow at the feasts. Under the directions of this high functionary, the *obsonators* brought on the meats, fruits and delicacies for the repast, the *cubicularii* adorned the table couches and arranged the decorations, the *structor* prepared the dishes, the *dispensator* apportioned the labor, the food, and the chastisements, and the *atriensis* placed forth the trophies, precious furniture and adornments of the apartment.

Descending from his dais, or post of observation, the major domo makes the rounds. He inspects the peacock eggs; he decides whether the flour should be sieved through linen or horsehair mesh. He sees that the grasshoppers are fried only to a light golden color and that the snails furnished are those fattened by art and not common snails which feed in gardens. The nightingale tongues, the peacock brains, the ortolans, the wines, sauces and pastries must be prepared according to inviolate practices. For did not Pithyllus, the dainty, wear a net on his tongue to permit him more delicately to test savory dishes, and was not a glove sometimes worn on the hand to enable the guests to eat things hot, no forks being at that time provided?

The *dapiferi* brought the food into the dining room, and the *nomenculatores* informed the guests of the names and quality of the things which were to be served. Special dishes were, however, ceremoniously proclaimed by the major domo himself, who announced their names and qualities. The carvers, previously trained for many days, carved harmoniously in time with the music, every movement being perfectly timed. The *procillatores* bore the flagons around. The *flabellarii* drove away the flies with fans of peacock feathers.

Finally, the Roman banquet terminated; the *adversitores* with torches and lanterns conducted the guests home and the dietitian put on her hat and called it a day.—*Contributed by Adelia M. Beeuwkes, School of Public Health, University of Michigan, Ann Arbor.*

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Book Reviews

Tropical Nutrition and Dietetics. By Lucius Nicholls, M.D. 3rd ed. Baltimore: Williams & Wilkins Co., 1951. Cloth. Pp. 476. Price $6.

This book, as the name indicates, deals primarily with nutritional problems in the tropics. The first eight chapters review briefly the main facts regarding dietary factors and nutritional requirements which are common to all nutrition texts. The remainder is devoted to a consideration of the unique aspects of nutritional problems as encountered in tropical countries. The author draws from his long clinical experience in India and other countries of the Orient and presents first-hand material on the manifold aspects of nutritional problems as met in such areas.

Considerable attention is given to food supplies and dietary practices. There is a useful chapter on rice, the staple food in most of the Orient. It describes and illustrates the parts of the rice grain and their nutritive value and outlines methods of milling the grain, including details of the process of parboiling. There are good illustrations of the machinery and processes used. Other chapters contain a vast amount of information on numerous foods not found in usual texts: maize and its preparation in tortillas, millets, mealie meal, pulses, dhalls, soybean curd, taro, yams, manioc, gourds, pumpkins, palm nuts, oils, insects, and a large variety of vegetable products whose names occur in oriental literature, but of whose nature the usual reader is unaware. One chapter deals with condiments, spices, and beverages: capers, chili, coriander, fennel, barks, curry powders, toddy, native beers, and many other products. A twenty-five-page table summarizes the food value of these unusual foods as well as others commonly used in these countries. One chapter is devoted to insect pests of cereals and pulses, describing their life history and methods of control, and another deals with food poisoning from ackee and manioc, selenium, fluorine, solanin, and other toxic products.

To this reviewer, the sections dealing with oriental foods constitute the unique contribution of the book and alone make it a valuable compendium for nutrition workers, especially those dealing with tropical foods, but also for others who encounter reference to these foods in the nutritional literature.

Useful also, especially to the teacher of nutrition, are the sections of the book that describe nutritional deficiency diseases as the author has observed them in his wide clinical experience. These are found chiefly in two chapters, one (Chapter IX) on disorders of nutrition and another (Chapter XVIII) which outlines methods of making nutritional surveys. The original illustrations of deficiency signs are taken from the author's own practice, and some are especially noteworthy: the crazy pavement eruption, keratomalacia in an adult, gray hair in boys due to prolonged malnutrition, and toadskin.

In the United States, the book will find its greatest usefulness as a reference text for the vast amount of information it contains on oriental foods and food processing, but the author's observations and illustrations of nutritional deficiencies will also be read with interest and profit.—*Lydia J. Roberts, Ph.D., Head, Home Economics Department, University of Puerto Rico, Rio Piedras.*

Quantity Recipes from Meals for Many. By Marion A. Wood and Katharine W. Harris. 2nd ed. Ithaca, N. Y.: New York State College of Home Economics, Cornell University (order from Mailing Room, Roberts Hall, Cornell University), 1952. Paper, hard bound. Pp. 233. Price $1.

Quantity Recipes is a revision of *Meals for Many* by Katharine W. Harris and Marion A. Wood. This book provides, as the authors intended, an excellent guide for small institutions, schools, school lunch managers, camps, and community groups. The recipes are for 50 portions.

The section on food preparation guides is clear and concise with many helpful suggestions and ideas. Information concerning preparation, cooking methods, and serving is included in each section. The illustrations on meat and poultry serving, along with step-by-step instructions, are well done. Effective illustrations are also used to demonstrate steps in procedure and appearance of finished products.

Recipes for sauces and relishes; soups; meats and poultry; fish; vegetables; salads and salad dressings; sandwiches; hot breads; desserts; and beverages are included. The directions accompanying the recipes are well arranged and printed. The methods are clearly stated and easy to follow. There are enough recipes in each group to provide a variety of suggestions in menu planning.

This well-planned and well-written book should be useful to inexperienced cooks and lunchroom managers.—*Bonnie Beilfuss Miller, Assistant Chief, Dietetic Service, Veterans Administration Hospital, Hines, Illinois.*

Nutrition and Chemical Growth in Childhood. Volume III, Calculated Data. By Icie G. Macy, Ph.D., Sc.D. Springfield, Illinois: Charles C Thomas, 1951. Cloth. Pp. 726. Price $8.

Volume III of *Nutrition and Chemical Growth in Childhood* presents a wealth of information for the research person who is interested in the nitrogen, mineral, and energy requirements of children. The book is particularly valuable because it gives individual data on the ingestion, absorption, and retention of the major minerals and nitrogen during numerous successive metabolism studies. Individual values for the absorption of fats and carbohydrates by children are also presented.

There is no other source of information equal to this reference for the research person or clinical worker who wishes to study the progressive chemical growth of children. The authors are to be thanked for making these data available.—*Gladys Everson, Ph.D., Professor of Nutrition, Iowa State College, Ames.*

RECENT BOOKS RECEIVED

Biological Antagonism. By Gustav J. Martin, Sc.D. New York: The Blakiston Company, 1951. Cloth. Pp. 516. Price $8.50.

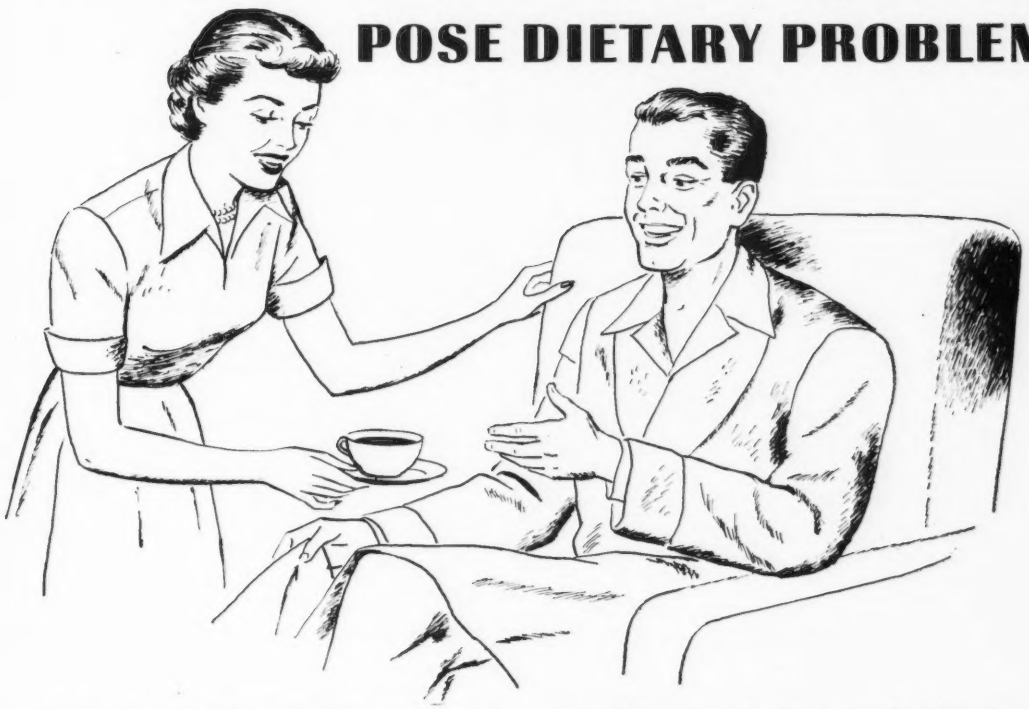
Management of Celiac Disease. By Sidney V. Haas, M.D., and Merrill P. Haas, M.D. Philadelphia: J. B. Lippincott Company, 1951. Cloth. Pp. 188. Price $5.

Feast Day Cookbook. By Katherine Burton and Helmut Ripperger. New York: David McKay Company, Inc., 1951. Cloth. Pp. 194. Price $3.

The Clinical Use of Fluid and Electrolyte. By John H. Bland, M.D. Philadelphia: W. B. Saunders Company, 1952. Paper. Pp. 259. Price $6.50.

Job Descriptions and Organizational Analysis for Hospitals and Related Health Services. By U. S. Department of Labor and U. S. Employment Service, in cooperation with the American Hospital Association. Washington: Government Printing Office, 1952. Cloth. Pp. 532. Price $2.

When Functional Derangements POSE DIETARY PROBLEMS



In the interest of maintaining good nutrition in the patient, many functional derangements of the gastrointestinal tract make the use of a well rounded dietary supplement, such as Ovaltine in milk, highly advantageous. Among such functional derangements more commonly encountered are nausea, anorexia, gastritis, diarrhea, dysentery, enteritis, and colitis.

In these conditions, Ovaltine in milk is particularly useful, not only because of its easy digestibility but also because of its blandness and its high nutrient content. It offers the opportunity of providing a balanced fare of essential nutrients without mechanical irritation or excessive digestive demands. Hence it qualifies especially when customarily eaten foods are contraindicated and a nutritious bland diet is required.

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FAT	30 Gm.	ASCORBIC ACID	30 mg.
CALCIUM	1.12 Gm.	NIACIN	6.7 mg.
COPPER	0.7 mg.	PANTOTHENIC ACID	3.1 mg.
IODINE	0.7 mg.	PYRIDOXINE	0.6 mg.
IRON	12 mg.	RIBOFLAVIN	2.0 mg.
PHOSPHORUS	940 mg.	THIAMINE	1.2 mg.
CALORIES	658		

Two kinds, Plain and Chocolate Flavored. Serving for serving, they are virtually identical in nutritional content.

SECOND ANNUAL A.D.A. PHOTOGRAPHIC CONTEST

The American Dietetic Association announces a contest for photos showing the activities and life of dietitians and nutritionists. Anyone may enter. The contest opens April 15 and closes June 15.

Prizes will be cash awards

First	**$75**
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Third	**15**
15 Prizes	**5**

Rules:

1. The contest is open to the general public. CONTEST OPENS APRIL 15 AND CLOSES JUNE 15, 1952. No entry fee is required.
2. Any number of black and white glossy prints may be submitted by an entrant. Prints must be 8 x 10. No acknowledgment of receipt of entries will be sent, unless entrants enclose an addressed postal card to be signed and returned.
3. Subject matter is restricted to the life and activities of dietitians and nutritionists. The central figure should be a dietitian or nutritionist in a job or training situation. A close-up, action picture is preferable. The setting may be outdoor or indoor. When a white uniform is worn (it should be worn if the job situation requires one), all of the details concerning the uniform and other articles of apparel should be correct—i.e., uniforms long-sleeved and well-pressed; hair neatly dressed; no caps (dietitians in the armed services and Veterans Administration may be photographed with caps); no handkerchiefs in pockets; no conspicuous jewelry as earrings or large rings; conservative white shoes (no wedgies, no high heels, no ankle straps). IF POSSIBLE, CONSULT A MEMBER OF THE AMERICAN DIETETIC ASSOCIATION ON CORRECTNESS OF DETAILS SUCH AS DRESS, EQUIPMENT, AND SURROUNDINGS SHOWN IN THE PICTURE.
4. Prints may be mounted or unmounted.
5. Pictures which have been published in, or accepted for publication or are under consideration by any women's or youth magazines are not eligible as contest entries.
6. Each print must be accompanied by a filled-in entry blank as provided here, or facsimile thereof. Please print or typewrite the information requested on the blank. Additional entry blanks may be obtained by writing the Contest Editor, The American Dietetic Association.
7. No entries will be returned until after announcement of the winners. Pictures which do not win prizes will then be returned, provided a self-addressed and stamped envelope, or addressed label and postage are contained in the same package in which each lot of entries is sent. Do not send postage separately for return. The Contest Editor cannot enter into correspondence of any kind regarding entries.
8. Prize-winning prints, including all reproduction and promotional rights, BECOME THE EXCLUSIVE PROPERTY OF THE AMERICAN DIETETIC ASSOCIATION. All entrants whose photographs are under consideration for prizes will be required to FURNISH ORIGINAL NEGATIVES BEFORE PRIZES ARE AWARDED. All prize-winning negatives become the exclusive property of The American Dietetic Association. Written releases from all persons photographed must accompany the negatives. (Sample releases may be obtained by writing to the Contest Editor.)
9. Judges will be as follows:
   Nowell Ward, Associate of the Royal Photographers Society in London, and winner of photographic awards in the U. S. and Europe
   Warren Wetherell, Advertising Consultant and Designer
   Dr. Margaret A. Ohlson, President, The American Dietetic Association
   Decisions of the judges will be final.
10. Address all entries to Contest Editor, The American Dietetic Association, 620 North Michigan Avenue, Chicago 11, Illinois. Final entries must be postmarked not later than midnight of June 15, 1952.
11. Prize winners will be announced in the September 1952 issue of the *Journal of The American Dietetic Association.*
12. While exercising the utmost care in handling entries, The American Dietetic Association assumes no responsibility for loss or damage of contest entries.

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Please enter the enclosed picture in The American Dietetic Association Photographic Contest for 1952.

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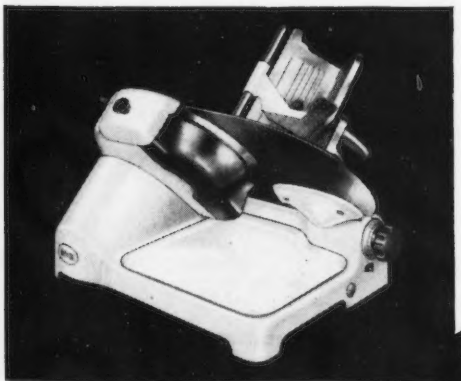

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Current Literature

Contributed by Mildred Bonnell and administrative interns, University of Washington, Seattle; Janette C. Carlsen and Ethel M. Miller, The Johns Hopkins Hospital, Baltimore; Pauline Kegereis, The Children's Mercy Hospital, Kansas City, Missouri; and the Journal staff

THE AMERICAN JOURNAL OF DIGESTIVE DISEASES

Vol. 19, January, 1952

* Hyperinsulinism—a factor in rheumatoid arthritis. E. M. Abrahamson.—p. 1.

A simplified method for the calculation of diabetic diets. S. B. Beaser.—p. 6.

* Treatment of obesity. S. Weiner.—p. 24.

Hyperinsulinism in Rheumatoid Arthritis. In this article it is postulated that rheumatoid arthritis might be accompanied by hyperinsulinism. In one individual this hypothesis was proved. The patient had been subjected to a state of chronic partial glucose starvation for many years, because of the vogue for a low-carbohydrate diet for rheumatoid arthritis. With restoration of normal blood glucose levels, the muscles were better nourished and responded with more normal function. The muscle spasms were relieved and less strain on muscles themselves permitted greater motion in the joints. The diet given was based on four principles: (a) relatively high in fat to depress insulin activity; (b) carbohydrates restricted to those slowly digested and absorbed; (c) food taken in frequent small meals; and (d) caffeine omitted because it is a common exciting cause for hyperinsulinism.

Treatment of Obesity. The problem of obesity can be successfully met in the physician's office. The importance of close supervision and frequent observation in controlling related emotional factors is emphasized. The following is advocated: insist on development of satisfactory dietary habits, plan an adequate diet with sufficient bulk, and include liberal portions of high-protein foods. Appetite-curbing drugs may be given if necessary.

AMERICAN JOURNAL OF SURGERY

Vol. 83, January, 1952

* Value of parenteral nutrition in the poor risk surgical patient. C. D. Rice, P. Bauer, and J. H. Strickler.—p. 50.

Parenteral Nutrition in Surgical Patients. Adequate nutrition plays an important role in the smooth convalescence of the surgical patient. In a state of poor nutrition there may be loss of water, electrolyte, protein, carbohydrate, and vitamin stores. It is important that nutritional deficiencies be corrected as well as the glucose and saline requirements provided. When nutritional requirements have been filled, it is easier to correct the electrolyte imbalances that may occur. In patients whose nutrition was adequately maintained, fewer complications occurred than in patients whose nutrition was inadequate. When adequate parenteral nutrition is provided in the post-operative period, the patient's admission weight will be maintained. This should serve as a fairly accurate clinical index of the patient's state of nitrogen balance.

ARCHIVES OF PEDIATRICS

Vol. 68, November, 1951

* Further studies of vitamin B_{12} in reproduction and lactation. B. Sure.—p. 540.

Vitamin B_{12} in Reproduction and Lactation. In a study of the influence of vitamin B_{12} on reproduction and lactation in four groups of albino rats, the infant breakfast food, Cerevim, comprised the basal diet, furnishing the proteins, minerals, and all components of the B-complex with the exception of B_{12}. The diet proved adequate for successful reproduction and lactation only when supplemented either with vitamin B_{12}, 1 per cent of the animal protein factor, or when the content of dry skim milk in the ration was doubled.

THE BRITISH JOURNAL OF NUTRITION

Vol. 5, Nos. 3 & 4, 1951

* Vitamin C reserves of British troops in England and Scotland during the winter and spring, 1941-2. W. R. G. Atkins.—p. 275.

* The toxicological aspects of food adulteration J. M. Barnes.—p. 377.

* Chemical additives and adulterants in food. J. B. M. Coppock.—p. 383.

Ascorbic Acid Reserves in British Troops. To determine the ascorbic acid reserve of British troops in relation to its bearing upon the prevalence of gingivitis and scurvy, comparisons were instituted between recruits with less than one month's service and soldiers of over one year's service. Ascorbic acid status was ascertained by giving large daily doses and analyzing a sample of urine collected 3 to 6 hr. after administration and noting the number of days necessary for saturation. The test was administered in various commands in different parts of the country and during two seasons, winter and spring. Results are recorded in graphs and charts with the recruits showing a superior ascorbic acid status as compared with the soldiers. The author concludes that it would appear unwise to accept as satisfactory a reserve of ascorbic acid considerably lower than that of the young civilian working-class population. The evidence available pointed to the desirability of increasing the ascorbic acid supply of the troops in winter.

Toxicologic Aspects of Food Adulteration. For study purposes, the definition of food adulterants was extended to include substances added to foods for a specific purpose as well as those which are substitutes for proper nutrients. An outline is given of the methods of investigating toxicity of synthetic chemicals used in the food industry, and several examples of problems in toxicity are discussed. The conclusion is that it is not easy to design an experimental method to determine whether a substance will be harmless if added to the human diet. It is unlikely that anyone will press for the use of a substance that can be shown to possess an acutely toxic effect on animals, even though its effect on man cannot be definitely determined. Therefore it seems likely that the problem of food adulteration by chemical substances will come to lie within the field of nutrition rather than in the more limited one of toxicology.

Chemical Additives in Food. Two forms of initial screening are proposed for determining the functional value of chemical additives in foods. The first would define the degree of potential acute toxicity over a definite period. The second would be a precise assessment of the practical usefulness of a chemical substance when added to food. Only if the second were positively affirmed would a third stage of long-term toxicity tests and studies of effects on nutrition be undertaken. As an example of examining a processing aid, it is shown that silicone pan-glaze can be used in bread production without hazard to the consumer. Another group of experiments shows that it is possible to provide precise information on the functional value of food additives. A third experiment illustrates the examination of a detergent substance which may be unsafe for use under certain conditions. Such experiments should give the pharmacologist, the chemist, the nutritionist, the clinician, and the food scientist the opportunity to discuss and explore together the problems involved in introducing new substances into foods.

BRITISH MEDICAL JOURNAL

I, January 5, 1952

* Intestinal macrocytic anemia. C. M. Watson and L. J. Witts.—p. 13.

Intestinal Macrocytic Anemia. In man there is the well known association of megaloblastic anemia with intestinal stricture. By an operation on the rat's small intestine and formation of cul-de-sac, macrocytic anemia can be produced. This anemia is sometimes associated with hemolysis and sometimes steatorrhea. It

The High Nutritional Values of Meats in a Can

From the standpoint of good nutritional qualities and appetite appeal, canned meat ranks among the best of foods.[1] In nutritional values—protein, fat, vitamins, and minerals—meat preserved by modern methods of canning and meat of like variety prepared in the home virtually are interchangeable.

In canned meat, about 60 to 70 per cent of the initial thiamine content, 90 to 100 per cent of the riboflavin and of the niacin, and 70 to 80 per cent of the pantothenic acid contents are retained.[1] With due allowance for the difference in the two cuts of beef compared, the following analyses of home-cooked beef round and of canned roast beef indicate their nutritional similarity.

Composition of 100 Gm., Edible Portion

	Kitchen-Cooked Beef Round[2]	Canned Roast Beef[2]
Water	59%	60%
Calories	233	224
Protein	27 Gm.	25 Gm.
Fat	13 Gm.	13 Gm.
Minerals, total	1.3 Gm.	2 Gm.
Phosphorus	224 mg.	116 mg.
Iron	3.4 mg.	2.4 mg.
Thiamine	0.08 mg.	0.02 mg.
Riboflavin	0.22 mg.	0.23 mg.
Niacin	5.5 mg.	4.2 mg.

The canning procedure has little effect upon the biologic value of the protein of meat.[3] In a recent study of the amounts of 18 amino acids in processed meats, canned beef, pork and lamb were generally similar in amino acid composition to fresh and kitchen-cooked samples.[4] Canned meat also is an excellent source of iron.

Since thoroughly heat-processed, canned meats keep well in all climates and are economical and easy to transport, they provide a year-round reserve of meat for daily use in homes, eating establishments, institutions, and hospitals. Tremendous quantities of canned meat contribute to the food needs of our armed forces.

Conditions of modern living make canned meat one of the important foods a large segment of the American people rely upon for good nutrition. Thoroughly cooked and ready for serving at a moment's notice, meat in a can is economical both in cost and in time spent in the kitchen.

REFERENCES

1. Howe, P. E.: Foods of Animal Origin, Handbook of Nutrition, American Medical Association, ed. 2, Philadelphia, The Blakiston Company, 1951, chap. 26, p. 637.
2. Watt, B. K., and Merrill, A. L.: Composition of Foods—Raw, Processed, Prepared, Agriculture Handbook No. 8, United States Department of Agriculture, 1950.
3. Stewart, J. A., and Clark, B. S.: The Canned Food Reference Manual, American Can Company Research Division, ed. 3, New York, American Can Company, 1947.
4. Schweigert, B. S.; Bennett, B. A.; McBride, B. H., and Guthneck, B. T.: Amino Acid Content of Processed Meats, J. Am. Dietet. A. *28*:23 (Jan.) 1952.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

ACCEPTED COUNCIL ON FOODS AND NUTRITION AMERICAN MEDICAL ASSOCIATION

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responds well to folic acid or aureomycin, but poorly or not at all to vitamin B_{12}. It is possible that the cause of this anemia is due to alteration of intestinal flora that are in some way concerned with absorption or utilization of hemopoietic substances.

THE CANADIAN MEDICAL JOURNAL

Vol. 66, January, 1952

Thiamin therapy in neuro-psychiatry. L. Gregory. —p. 12.

CEREAL CHEMISTRY

Vol. 28, November, 1951

* The influence of various sugars on dough and bread properties. H. N. Barham, Jr., and J. A. Johnson. —p. 463.

Influence of Various Sugars on Bread. Few facts are available that compare the effects of glucose, fructose, invert sugar, and sucrose when used in a commercial sponge-dough process. Four flours were chosen—two commercially milled from hard red spring wheat and two from hard red winter wheat. Four sugars—glucose, sucrose, fructose and invert sugar—were used. The invert sugar consisted of equal parts of glucose and fructose. The same sponge-baking procedure was used in every test. Charts and graphs show the results of the experiments which were concerned with the effect of the sugars on the quality of bread and the effects of their concentration on specific volume, or the total gas production and gas retention. Higher sugar concentration reduced both the rate and the amount of gas production in a fermenting dough. At optimal sugar concentrations, there was no significant difference on the quality of bread that could be attributed to the kind of sugar.

ENDOCRINOLOGY

Vol. 49, December, 1951

* Effect of ascorbic acid, potassium chloride flooding, and cortisone on the course of formaldehyde-irritation arthritis. H. Bacchus.—p. 789.

Hormones and Arthritis. The action of ascorbic acid, potassium chloride flooding, and cortisone on the course of formaldehyde-irritation arthritis was studied. Recovery was speeded by ascorbic acid. It has been demonstrated that ascorbic acid, while altering the adrenal response to stress, fails to stimulate the adrenal cortex. It is suggested that potassium chloride flooding exerts its action by inducing a persistent mineralocorticoid insufficiency.

JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Vol. 148, January 19, 1952

* Weight control. Editorials and Comments.—p. 206.

Blood lipids and atherosclerosis. Editorials and Comments.—p. 207.

* Food poisoning. Queries and Minor Notes.—p. 243.

Vol. 148, February 2, 1952

Method of increasing sensitivity of glucose tolerance test. H. Berger.—p. 364.

* Liver and plasma protein synthesis. Editorials and Comments.—p. 376.

* Hazards of antibiotic feed supplements. Editorials and Comments.—p. 376.

Vol. 148, February 9, 1952

Anaphylactic shock following intravenous administration of vitamin B complex. Clinical Notes.—p. 461.

* Lecithin and coronary insufficiency. Queries and Minor Notes.—p. 500.

Weight Control. Reviewing the dangers of obesity, attention is called to an experiment in psychologic motivation through group therapy tried in Boston. It is suggested that such efforts have interesting possibilities.

Food Poisoning. A physician asks if there might have been antimony poisoning involved in an incident in which some eight children developed symptoms of food intoxication. The food was egg salad, made with a salad dressing containing vinegar. The salad had been stored (without refrigeration) in an enamel container from which some of the enamel was chipped. The answer made is that antimony poisoning might possibly have occurred, but since antimony is relatively insoluble, it is more likely that the usual bacterial toxins caused the food poisoning. Sometimes acid foods, such as lemonade, stored in containers plated with cadmium cause poisoning, and these possibilities deserve consideration.

Protein Synthesis. Recent experiments on perfused livers shows further evidence that, for fabricating plasma proteins at *rapid* rates, nonessential as well as essential amino acids are required. Studies also show that nonhepatic tissues can remove amino acids from perfusion fluid and convert them into tissue proteins and plasma globulin, but these tissues cannot synthesize albumin.

Antibiotic Feed Supplements. Widespread use of antibiotics in animal rations has increased the growth rate of farm animals. However, it has been shown that Salmonella, which is virulent to man and which originates in poultry, becomes resistant to antibiotics. Because the use of expensive antibiotics with poultry is uneconomic, this problem appears to be of no great consequence; however, it is economic with larger animals, and thus drug-fast strains of Salmonella in meat animals might be serious. Further, it is not known whether some of the yeast or yeast-like organisms in the intestinal flora of poultry, which increase during prolonged antibiotic feeding, might be pathogenic to man.

Lecithin. A physician asks if it is possible that a commercial preparation of lecithin eaten with cereal could relieve pain in coronary insufficiency. The answer is that lecithin added to the diet is not apt to have any early effect on pains of coronary insufficiency, although there might be a remote benefit from its use. Such benefits have not yet been proved.

THE JOURNAL OF BIOLOGICAL CHEMISTRY

Vol. 194, January, 1952

* Effect of insulin on the metabolism of adipose tissue from normal rats. N. Haugaard and J. B. Marsh.—p. 33.

* The intestinal absorption of triglycerides. R. Reiser, M. J. Bryson, M. J. Carr, and K. A. Kuiken.—p. 131.

* Vitamin D and citraturia. S. A. Bellin and H. Steenbock.—p. 311.

The threonine requirement for growth. W. C. Rose, R. E. Koeppe, and H. J. Sallach.—p. 317.

Growth on diets devoid of glycine, serine, and cys- and low in choline. W. C. Rose, W. W. Burr, Jr., and H. J. Sallach.—p. 321.

Effect of Insulin on Adipose Tissue. The fat which lies in either flank of albino rats was used as tissue in experiments showing that, in addition to functioning as a fat depot, adipose tissue appears to be metabolically active and carries out a number of catabolic and synthetic reactions. The effect of insulin on respiration of adipose tissue was studied with the finding that it increased the oxygen uptake of adipose tissue in the presence of glucose, succinate, lactate, pyruvate and to a lesser extent, acetate. Findings further indicated that insulin combines rapidly with structures of intact cells and in combined form alters the metabolic pattern of the tissue. This strengthens the concept that the chemical combination of insulin with tissue is a prerequisite for physiologic and insulin action.

Intestinal Absorption of Triglycerides. A study was made on rats of the mechanism of fat absorption by the use of synthetic triglycerides labeled with C^{14}. It was found that 25 to 45 per cent of the ingested glycerides were completely hydrolyzed during absorption. The remaining 55 to 75 per cent were hydrolyzed to monoglycerides. The hydrolyzed glycerol was not utilized for resynthesis of lymph glycerides but followed an independent metabolic pathway. Half the lymph phospholipide formed from ingested fat utilized the hydrolyzed fatty acids and endogenous glycerol. The other half was synthesized from absorbed glycerides.

Vitamin D and Citraturia. A study on the effect of vitamin D on citrate excretion was done on young and adult rats because of the high level of citric acid in the urine of rachitic rats. It was found that the urinary citrate excretion was increased when excessive amounts of vitamin D were given in rats fed low-phosphorus rations, low-phosphorus-alkaline rations, low-phosphorus-acidic rations, and normal rations. The level of citrate elimination was highest on the low-phosphorus rations, but increases due to vitamin D were highest on rations containing phosphates. With low-phosphorus rations, dietary calcium also increased the urinary citrate.

JOURNAL OF HOME ECONOMICS

Vol. 44, January, 1952

* Is blanching necessary when vegetables are to be kept in frozen storage a month or less? I. Noble and J. D. Winter.—p. 33.

* Home-frozen French-fried potatoes. E. H. Dawson, O. A. Hammerle, and P. Trimble.—p. 36.

Vol. 44, February, 1952

* Effects of the size and shape of the baking pan on the quality of shortened cakes. H. Charley.—p. 115.

Growth on cereal and milk diet. F. L. Beinert.—p. 119.

Blanching Vegetables. For gardeners who want a quick method of storing an oversupply of fresh vegetables for relatively short periods, an experiment in

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quick freezing without scalding was undertaken. The purpose was to find whether serious deterioration took place in unblanched vegetables stored at 0°F. for periods of from one week to a month. Asparagus, green beans, and sweet corn, the latter both husked and unhusked, were used. All samples stored without blanching showed marked deterioration in flavor, color, and quality at one, two, three, and four weeks. The scalded control samples showed little change from the beginning to the end of the storage period; therefore, the recommendation of scalding before freezing is made no matter how soon the vegetables are to be used.

Home-Frozen French-Fries. Because of the time and attention required to prepare French-fried potatoes before a meal, it would be advantageous to the homemaker to preserve them by home-freezing methods and have them ready to serve. Tests were made to determine the practicability of home-freezing on the basis of quality and storage life during a year in frozen storage. Freshly dug, mature white potatoes of one variety were prepared, fried in hydrogenated fat, drained, and allowed to cool. No salt was added. Because of the high fat content, making the potatoes subject to deterioration by oxidation, two methods of packing, with and without evacuation of air from the containers, were tested. In general acceptability, the freshly frozen French-fries, packed without air evacuation and kept not more than two months at 0°F., were rated favorably as compared with freshly fried potatoes. When stored for longer periods, changes in flavor and texture were noted.

Cake Baking Pans. Three cake batters were used for testing two sets of pans of varying dimensions. The most marked effect of variations in size and shape of pans was on the appearance of cakes. Another finding was that with a uniform pan capacity, the shallower the pan and the more rapid the heat penetration during baking, the larger was the cake. No consistent effect on crumb quality was associated with size or shape of the pans, but shallower pans, compared to deeper ones of the same length and width, yielded larger and more tender cakes with more delicately browned crusts and flatter tops.

THE JOURNAL OF NUTRITION

Vol. 46, January, 1952

* Biological availability of certain foods as sources of riboflavin. G. Everson, E. Pearson, and R. Matteson.—p. 45.
* Dietary factors affecting gastric secretion in the rat E. A. Hawk and J. M. Hundley.—p. 87.
* Effect of aureomycin and penicillin upon the vitamin requirements of the rat. H. E. Sauberlich. —p. 99.
* Factors concerned with the different erosive effects of grapefruit and grapefruit juice on rats' molar teeth. R. A. Gortner, Jr., and R. K. Kenigsberg.—p. 133.

Nutritive Limitations of Foods. Metabolism studies have been conducted on four young women to determine the degree to which green peas, ice cream, almonds, and soybeans are digested by this age group. There was nearly complete absorption of fat from ice cream, less satisfactory use of fat from soybeans, and poorest digestion and absorption of the fat present in almonds. The green peas contributed too little fat for accurate comparison. Almonds also provided the smallest percentage of digestible protein. There were small differences among the coefficients of digestibility of the proteins of peas, soybeans, and ice cream. The results of these studies suggest that too little is known about the degree to which foods are digested. It is believed that the incomplete digestion of certain foods influences not only the availability of protein, fat, and calories, but also the availability of the vitamins present, and there may be considerable overestimation of the value of certain foods if they are judged by their composition alone.

Gastric Secretion in the Rat. Rats maintained on a stock diet secreted larger volumes of gastric juice in 6 hr. following pylorus ligation than did those on a "complete" purified diet. The difference was relatively greater in animals maintained on diets for longer periods. The inclusion of certain wheat products or meat meal in the purified diet increased the volume of secretion although not up to the stock diet level. These findings suggest that the purified diet was deficient in some factor or factors affecting gastric secretion.

Antibiotics and Vitamins. Studies were made on the effect of aureomycin and penicillin on the growth of weanling rats fed diets deficient in certain B vitamins. The addition of penicillin to the diet (0.01 per cent) caused a marked stimulation in the growth of rats fed diets free of or low in thiamine, pyridoxine, pantothenic acid, and to some extent riboflavin. Aureomycin (0.01 per cent) had a similar effect in the case of pantothenic acid and thiamine deficiencies. The inclusion of penicillin or aureomycin in the completely vitamin-supplemented basal diet had no effect on growth. The antibiotics, it is concluded, may have a "moderating" or "sparing" effect on the requirements of the weanling rat for certain vitamins, the effect appearing to be somewhat dependent on the vitamin under study.

Tooth Erosion by Grapefruit and Juice. Studies reported in this paper confirmed previous findings that consumption of fruit juice causes considerably greater erosion of the lower molars of rats than does ingestion of actual fruit with similar juice content and *p*H. The experiment was continued by reconstituting pressed grapefruit juice into a simulated "fruit" by the addition of 3 per cent bacto-agar or 5 per cent foamed, compressed gelatin. These preparations affected the teeth in about the same manner as the natural fruit and were much less destructive than the juice from which they were prepared. By pair-feeding of eight completely desalivated rats with litter mate controls, it was shown that salivary buffering had no detectable influence on the extent of tooth erosion induced by either grapefruit or grapefruit juice and could not explain the different destructive effects of the two supplements. It is concluded that mechanical differences such as the consistencies of the acid supplements and the different manners of ingestion, rather than chemical differences, are responsible for the effects noted.

JOURNAL OF PEDIATRICS

Vol. 40, January, 1952

* The lipoproteins of serum in infancy and childhood. I. Lipoproteins in normal children. C. H. Kempe, H. K. Silver, F. S. Smith, J. W. Gofman, and H. B. Jones.—p. 11.
* The lipoproteins of serum in infancy and childhood. II. Lipoprotein levels in juvenile diabetes mellitus. J. B. Carr, C. H. Kempe, H. K. Silver, F. S. Smith, J. W. Gofman, and H. B. Jones.—p. 119.

Lipoproteins of Serum in Infancy and Childhood. Determinations of the concentration of certain lipoprotein molecules (S_f 10–20 class) are reported for 147 normal children ranging in age from birth to fifteen years. These molecules previously have been shown to be associated with atherosclerosis. Similarity of values was found for normal male and female children. Boys had significantly lower values than those previously determined for normal male adults, but the levels for girls approximate the range for young normal female adults. No correlation was present between the concentrations of these lipoproteins in the sera of newborn infants and their mother. No significant correlation was noted between the total serum cholesterol and the level of the S_f 10–20 class. The data presented would indicate that children can tolerate a much higher intake of fat per unit of body weight than adults without showing comparable increases in concentration of the S_f 10–20 molecules.

Lipoprotein Levels in Juvenile Diabetes Mellitus. Determinations of the concentration of certain lipoprotein molecules (S_f 10–20 class) are reported for forty-six children with diabetes mellitus. Diabetic girls and boys have higher levels than their normal counterparts. The values for the girls were higher than those for boys. No close correlation was found between the level of S_f 10-20 lipoprotein molecules in the sera and the duration of the diabetic state, the degree of control, the severity of the disease, the analytic serum cholesterol levels, or the dietary intake of fat per unit weight.

NUTRITION

(Formerly Nutrition: Dietetics: Catering)

Winter, 1951

*Dehydrated foods. R. F. Milton.—p. 292.

Dehydrated Foods. The controlled removal of most of the water content of foods is the aim of dehydration processes so that moisture content can be reduced below the point favorable to bacteriologic action, mold growth, and enzyme action. It is also practiced to reduce the bulk of foods in order to save storage space in building food reserves. All methods depend on the use of warm air, although methods vary according to the food to be dehydrated. Good dehydration will retain the palatability of the

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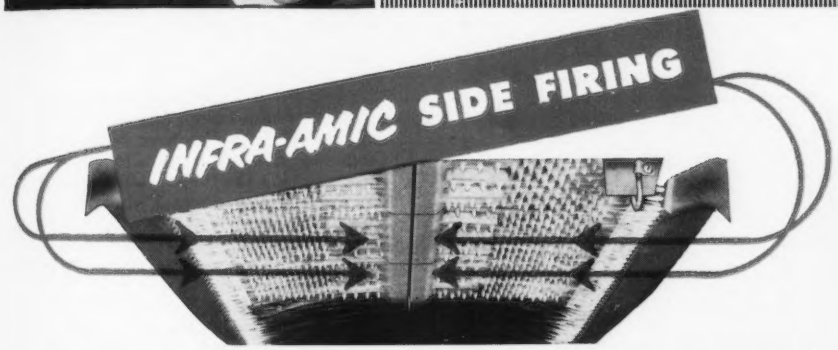

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food, cause as little change as possible in the fundamental nature of the product, and allow for easy reconstitution. It should cause little change in caloric and health value of foods, although there may be some changes in the natural characteristics of the constituents. Because dehydrated foods tend to absorb moisture, they must be kept in airtight containers, under which conditions their keeping properties seem to be indefinite.

NUTRITION REVIEWS

Vol. 10, February, 1952

* The nutritive evaluation of protein: A half-century of progress. H. H. Mitchell.—p. 33.
* Nutrient requirements in relation to body size and body function.—p. 42.
* The rice diet in hypertension.—p. 46.

Nutritive Evaluation of Protein. This is a short review of the growth of knowledge, through chemical and biologic evaluations, relative to the essential nature of protein molecules and their nutritional uses. The classification of the amino acids was an important advance in the nutritive evaluation of proteins by chemical analysis. By comparing the contents of the essential amino acids in eggs with those of other food proteins and computing the percentage deviations for each amino acid, the nutritive value of the protein is expressed as a "chemical score." In the biologic evaluation the distinction was first made between those proteins that can support normal growth and those that cannot. The nutritive values of proteins for maintenance, for instance, have been shown to be different from those for growth, dependent upon differences in amino acid requirements. The questions are raised as to whether nutritive values of proteins can be assessed without resort to biologic assay when their essential amino acid contents are accurately known, or if analytic methods can displace biologic assays in protein nutrition. It seems likely that chemical evaluation will give a first approximation of protein values in metabolism, but not in digestion, and that biologic evaluation will remain the "court of last resort."

Nutrient Requirements. The problem concerning the extent to which body functions and body size determine individual nutrient requirements is a challenging one, although at present there is only incomplete knowledge of the physiologic role of different nutrients. In making a summary of available information on the subject, the functions of nutrients in the body were considered to be provision of materials which enter into such structures as nerve fibers, the maintenance of tissue integrity, construction of new tissue, and liberation of energy for basal cellular activities. A table of nutrient requirements of adult animals is compiled, based on data as follows: body weight, body surface, metabolic body size, heat production, and amount of food consumed. Such a study, although it cannot be fully satisfactory in the given state of knowledge on the subject, brings together much of what is known and should stimulate further research.

Rice Diet in Hypertension. Two new reports of the rice diet in hypertension indicate that the rice-fruit diet is not satisfactory for ambulatory patients. An investigation of treatment with a more palatable diet, low in sodium, very low in fat, and higher than usual in carbohydrate content, unless weight reduction is necessary, is being planned. This should be a rational plan for a therapeutic nutritional regimen, since it seems quite clear that the greatest effect of the rice-fruit diet is due to its low salt content.

PUBLIC HEALTH NURSING

Vol. 44, February, 1952

* A food preference survey. A. P. K. Stapler.—p. 94.

Food Preference Survey. Findings of a recent small survey of food preferences for a Visiting Nurse Association would indicate that the universally appealing meal consists of: ham and eggs, hot buttered biscuits, celery sticks, broccoli à la Hollandaise, and strawberries topped with vanilla ice cream—with a possible addition of chocolate cookies. Ham, beef, and milk received a unanimously favorable vote; much disliked were glandular meats and many green and leafy vegetables, especially turnips and parsnips. Inlanders cared little for seafood, as contrasted with those who lived near a shore.

PUBLIC HEALTH REPORTS

Vol. 67, January, 1952

* Fluoridation of municipal waters. American Dental Association symposium. F. S. McKay, A. P. Black, M. E. Nicholson, and F. A. Bull.—p. 36.

Fluoridation of Municipal Waters. At the annual session of The American Dental Association three dentists and a chemist reported on the effectiveness of the fluoridation of municipal drinking water in reducing the incidence of dental caries. It is generally agreed that fluoride is the only known agent ordinarily included in the diet that is capable of exercising a mass control of dental caries, and that the control is effective during the period of calcification and not thereafter, although the caries inhibitory action of fluoride extends well into middle life. The simplest, cheapest, most effective, and most far-reaching method of insuring adequate fluoride is through the fluoridation of drinking water. In the future the process may be ranked with control of typhoid fever, milk-borne diseases, smallpox, and goiter as a remarkable research accomplishment and a major application of community health principles.

SCIENCE

Vol. 115, January 11, 1952

* The site of nitrogen absorption in rats fed raw and heat-treated soybean meals. R. W. Carroll, G. W. Henseley, and W. R. Graham, Jr.—p. 36.
* Reversal of the diabetogenic action of alloxan by sulfhydryl compounds. P. B. Sen and G. Bhattacharya.—p. 41.

Vol. 115, January 18, 1952

* The treatment of amebiasis with fumagillin. J. H. Killough, G. B. Magill, and R. C. Smith.—p. 71.

Vol. 115, January 25, 1952

* The absence of dietary effects on the DNA content of liver nuclei of the adult rat. R. M. Campbell and H. W. Kosterlitz.—p. 84.

Site of Nitrogen Absorption in Rats. In a study of the effect of heating on the digestibility and growth-promoting value of the proteins of soybean meal, adult rats were fed rations of unheated, solvent-extracted flakes, termed "raw." A second group received rations treated by 15-min. autoclaving at 121°C., termed "heated." Other factors were carefully controlled. Properly heated meal had only slightly higher digestibility than raw meal, and this difference was so small it could hardly account for the observed difference in growth-promoting value. It was noted that with properly heated meal, nearly all of the nitrogen that was ultimately to be absorbed was absorbed during passage of the meal through the small intestine. With the raw meal, much of the nitrogen appeared to be absorbed from the large intestine. It seems possible that when raw meal protein escaped hydrolysis in the small intestine, substantial quantities of pancreatic or intestinal glandular secretions may have been lost with it into the large intestine. Apparently the amino acids absorbed from the large intestine had little utility for growth.

Reversal of Diabetogenic Action. Diabetogenic doses of alloxan, administered intravenously, were effective in producing diabetes in rats a few minutes after reaching the blood. Large doses of sulfhydryl compounds, BAL and cysteine, given prior to alloxan, prevented this reaction, but prevention did not occur when the compounds were given 5 min. after the alloxan. A study is reported in this paper in which intraperitoneal or subcutaneous administration of alloxan was used rather than intravenous. With the change in method of administering alloxan, intramuscular injections of the sulfhydryl compounds, BAL and cysteine-HCl, were effective in prevention of diabetes even when administered as late as 30 min. after alloxan, although neither compound could prevent diabetes when given 1 hr. after alloxan.

Treatment of Amebiasis. This is a report of experiences with a new antibiotic, fumagillin, used in treating twenty-two adolescent and adult male patients hospitalized because of infection with *Endamoeba histolytica*. Laboratory studies conducted during treatment indicated that fumagillin is essentially nontoxic and shows activity against at least seven enteric protozoan parasites, being most effective against *E. histolytica*. Only further clinical trials will prove its definite value in the treatment of amebiasis.

Dietary Effects on DNA Content of Liver. Feeding a protein-free diet for periods up to three weeks was shown to have no influence on the desoxyribonucleic acid (DNA) content of the liver nuclei of a large number of adult male rats. In young rats, if the growth of the liver is impaired by severe dietary deficiencies, changes in the DNA content of the liver nuclei are likely to occur. However, the DNA content of the livers

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PROBLEM: Consumers expect to receive the same amount of vitamin C regardless of the type of juice they drink. But there is a big difference between juices (see table at right).

SOLUTION: It is in the public interest to standardize the vitamin C content of all of these juices, whether canned, frozen, or concentrated. A label claim for 100% of the minimum daily adult requirement may be made when the juice contains 30 mg. of vitamin C per serving.

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ASCORBIC ACID CONTENT OF CANNED JUICES

Below are examples of minimum and maximum levels of ascorbic acid in commercially canned juices. Note the wide variations! All figures are in milligrams per 100 grams of juice. Data from U. S. Department of Agriculture.

	Min.	Max.
Grapefruit juice	10.0	49.0
Orange juice	9.7	70.0
Pineapple juice	5.4	18.0
Apple juice	0.2	3.6
Grape juice	0.0	4.7
Tomato juice	2.5	32.0

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of adult rats may be considered a suitable standard of reference for liver constituents which vary with altered dietary conditions.

SOUTHERN MEDICAL JOURNAL

Vol. 45, January, 1952

* The use of protein hydrolysates in the therapy of peptic ulcer. J. S. Levy.—p. 5.

Protein Hydrolysates in Peptic Ulcer Therapy. Patients who have had massive hemorrhage, those who are malnourished, those who have allergic reactions to milk, and those with simple ulcer, but whose work requires greater energy output than is provided by the usual acute ulcer diets, need and profit by taking protein hydrolysates. When a hydrolysate is needed, it is used for its buffering capacity. Choose a hydrolysate with the highest percentage of hydrolysis to amino acids. It will be found to be a most effective buffer and least expensive. A mixture of 200 gm. protolysate in 2 qt. of milk with an equivalent amount of dextri-maltose or dexin added can be carried in thermos bottles to drink at hourly intervals. Because hydrolysate is not a palatable product, a complete explanation of the hydrolysate, its taste, and what is to be expected of it will usually "sell" the patient. Results of its use will outweigh its undesirable flavor.

AMERICAN RESTAURANT MAGAZINE

Vol. 36, February, 1952

* Good coffee means good business.—p. 44.
* 10-point check list for good restaurant design. M. J. Alster.—p. 52.

Good Coffee. Coffee is one beverage for which the restaurateur himself must take either credit or blame; faults of milk, fruit juices, and other drinks can be laid at the manufacturer's door. The average customer thinks he's a coffee expert—and in a way he's right, for he can quickly spot the watering-down of his favorite beverage. Succinct rules are given for good coffee-making: measuring of quantities, frequent making of coffee, proper timing in preparation, use of freshly-boiling water, knowledge of equipment, and care of equipment. Future prospects of coffee supply, quality, and—less encouragingly—prices are summarized.

Restaurant Design Check List. Accessibility to and from parking areas, spaciousness due to freedom from unnecessary posts or columns, and functional adequacy are only three of the ten essential points in this check list for good restaurant design. The article shows how decorative design and clean-cut simplicity, seemingly incompatible, can be combined. The building material shortage is discussed also.

COLLEGE AND UNIVERSITY BUSINESS

Vol. 12, January, 1952

How to buy residence hall furnishings. M. S. Mullen.—p. 30.
* Brown's dining hall builds creditable food habits. N. J. Strohmeyer.—p. 39.
* Maintaining and keeping records on kitchen equipment. C. Ricker.—p. 49.

Vol. 12, February, 1952

* Nonperishable foodstuffs inventory. A. Vitali.—p. 48.

College unions survey midwest food prices. L. C. Smith.—p. 49.

Brown's Dining Hall. The new refectory at Brown University, Providence, contributes to the University's cultural way of college life by eliminating the unmannerly rush found in its old cafeterias where non-fraternity men formerly ate. Ease, speed, and smoothness have been achieved, as well as the bringing together of all resident students under one roof—although fraternity and non-fraternity students retain the advantages of their own groups. Serving and dining space is on the top floor of this building, where students, served by classmates, are spared the noise and odors of the kitchen. On the lower floor are: the kitchen, a large dishwashing network, a cafeteria for personnel and guests as well as students' any-hour snacks, and a test kitchen. Breakfast is the only meal that students take in cafeteria fashion; table service prevails for other meals.

Records on Kitchen Equipment. Priorities and scarcities have made the institutional kitchen's "tools" increasingly valuable. Small institutions must learn from the large ones an adequate program of maintenance records and repairs. Suggestions are made for the type of records and filing systems needed for maintenance of equipment and for other supplies, such as china, glass, and silver. The program suggested in the article consists of four parts: (a) purchase and location of equipment; (b) permanent equipment records; (c) maintenance control records weekly, monthly, and yearly; and (d) employee training in care of equipment—specific examples of which are described.

Nonperishable Foodstuffs. Uncertainty as to supply of many foodstuffs, as well as the possibility of war, calls for a conservative inventory among institutional food buyers as well as food jobbers. Mount Holyoke College in Massachusetts maintains a policy calling for a canned-goods-and-staples inventory sufficient to carry the institution through a period of three months during the academic year and a smaller inventory during summer vacation. The college is thereby afforded the opportunity of taking advantage of price drops during the operating year.

FOOD ENGINEERING

Vol. 24, February, 1952

* New coating agent promises mold-free surfaces. L. G. Herman and C. L. Reed.—p. 71.

Eliminates odors from cookers. J. M. Samson.—p. 95.
* New churned margarine is texture triumph. L. E. Slater.—p. 111.

Coating Agent Averts Molds. Nontoxic copper-8-quinolinolate promises to be of outstanding value to food processors. When this basically new compound is properly applied in a paint or coating, it can save many dollars in a plant suffering from wall and ceiling growths. Suggestions are offered for applying fungicidal paint containing 8-quinolinolate under varying conditions. A list of "anti-mold briefs" is also given for surfaces of wood, masonry, tile and glass block.

Churned Margarine. Margarine with the body and texture of butter is now being produced. The process began with the simple idea that to obtain a butter-like texture, the margarine must be constructed like butter with respect to the fat-water emulsion. The same fats and oils are used as in conventional margarine, but the fat globules are dispersed in a milk medium to simulate cream. The reversible oil-milk emulsion is then broken by being subjected to a churning identical to that in butter making. The process is described in detail with photographic highlights.

FOOD PROCESSING

Vol. 13, January, 1952

* Chemicals in foods. C. N. Frey.—p. 6.
* USDA grade standards.—p. 11.

Use real creamery butter to make flavoring.—p. 18.
* Adequate niacin supply in near future.—p. 18.
* Powdered caramel color made from corn.—p. 19.
* Illustrates results of centrifugal mixing.—p. 19.

Impartial analysis of competition between cane, beet, corn sugars.—p. 20.

Chemicals in Foods. Satisfactory agreement among scientists on procedures to determine hazards and toxicologic behavior of intentional additives (which serve as nutrients or induce desirable chemical or physical changes) and incidental contaminants (used in control of insect pests or in modern sanitation practices) in food has not been reached. There is no absolute safety factor in regard to the food we consume, and individuals also vary in response to certain foods and chemicals. Standards and more effective labeling will be helpful in protecting the consumer. A Food Protection Committee has been organized by the National Research Council's Food and Nutrition Board to advise the federal and state governmental agencies and industry. The Committee's functions will be to assemble scientific information on both incidental and intentional chemical additives in food and to promote research on the use of chemicals in food production, processing, and preservation. The Committee will seek to develop guiding principles and standardized procedures essential to safeguard food and to encourage and aid in the distribution of accurate information to the public.

U.S.D.A. Grade Standards. A check list of new or proposed grade standards has been issued by the U.S.D.A. for the following: canned beets, canned pears, dry edible beans, frozen field and black-eyed peas, frozen spinach, and frozen concentrated citrus juice blend.

Adequate Niacin Supply. It is expected that by 1955 the use of synthetic pyridines will exceed coal tar pyridines, the present raw material for niacin, by more than 700 per cent. This will probably result in a lower price for niacin.

Powdered Caramel Color. Caramel from burnt sugar is available only in liquid form. This powdered caramel color,

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a natural food product made from corn sugar, is used by the government in dehydrated foods, such as emergency rations, powdered puddings, dehydrated soups, and other concentrated foods.

Centrifugal Mixing. Pictures of products resulting from centrifugal mixing of ingredients, such as a food mix, free-flowing liquids, prepared cake mixes, and powders, are presented. Specification data cover standard and corrosion-resistant mixers.

FORECAST FOR HOME ECONOMISTS

Vol. 68, February, 1952

* Season to taste. J. M. Rock.—p. 34.
* Some why's and how's of bulletin boards and exhibits. M. V. Downey.—p. 36.

Season to Taste. This article, beginning by a discussion of seasoning in general, provides an alphabetic "check list" of suggestions for unusual seasonings. Three books are also recommended for further ideas.

Bulletin Boards and Exhibits. "Horse and buggy" instruction, so ineffectual today when children are constantly exposed to colorful entertainment, can be helped partially by the use of imaginative visual aids such as bulletin boards and exhibits. Particularly in home economics can this be a constructive addition to routine classwork. Many ideas are given here, principally those in which the students can cooperate with the teacher. "All of this sounds like [and *is*] a lot of work," the author says, but "these activities are in themselves learning experiences of high value. . . Eventually the teacher will find she is able to act as supervisor, leaving more of her time free for bringing out. . . salient points. . . and working with those students who need special help."

HOSPITALS

Vol. 26, February, 1952

* One-quart cartons of milk used to insure safe distribution. J. Priver.—p. 85.
* Pay cafeterias improve employee morale. W. M. Ashman.—p. 86.

Milk in Cartons for Safety. Bacteriologic reports on milk samples several months ago sharply pointed up a potentially dangerous situation at one eastern hospital. Many samples were far above New York City's safe maximum bacterial count, and a few also indicated the presence of colon bacilli. At that time pasteurized milk was delivered daily in 40-qt. cans to the dietary department. These cans were then emptied into 30-gal. tanks which made the rounds of the wards. In each ward the amount needed would be poured into 10- to 20-qt. milk urns, refrigerated by a central rectangular shaft in which were inserted pieces of chopped ice—the ice frequently missing the shaft and falling into the milk. Pitchers were then filled with this milk and carried throughout the pantry and the wards, and the milk transferred to the patient's glass. It was, therefore, decided temporarily to convert to the use of 1-qt. cartons for milk. This procedure has become permanent and along with greater safety, has effected a saving in money, as there is no more surplus milk to stand too long and finally be poured down the drain.

Pay Cafeterias Improve Morale. Conemaugh Valley Memorial Hospital, Johnstown, Pennsylvania, reports success with its employee cafeteria, which has been on a cash basis since 1946. Before that time, employees compared their salaries unfavorably with those paid to industrial workers, because they did not consider the meals they were furnished without charge. By charging for meals and raising salaries to accommodate the additional expense, morale was raised. Other advantages of the system were: food waste was reduced, as non-paying "customers" frequently tend to order more than they actually wish or eat; income tax calculation for employees was simplified; revenue was received from meals purchased by staff and employees; and the workers are more content when they may eat where they choose.

THE HOTEL MONTHLY

Vol. 60, February, 1952

* Prunes are good in all kinds of dishes. R. Preschley.—p. 53.

Prunes. Prunes are always in season, always good, and always have a low unit cost. However, the human weakness of overlooking plentiful items has blinded many hotel men to the usefulness of prunes for meals other than breakfast. In foreign countries, where the food supply is smaller than in America, prunes are used in many dishes, including main courses. A few of these European uses are described. The nutritive value, preparation, and grades of prunes are discussed.

INSTITUTIONS

Vol. 30, February, 1952

* How to organize jobs to make fewer hands do more work.—p. 2.
* Induction training gets new employees off to good start.—p. 4.
* Low temperature meat roasting saves pounds—earns dollars.—p. 24.
* Sparkling silver.—p. 42.
* Apply detergent fundamentals to cleanser selection.—p. 69.
* Where there's steam there's flavor.—p. 132.

Make Fewer Hands Do More Work. Maintenance of an efficient staff is management's responsibility in the highly competitive field of institutional food service. Charting the work is an important step in eliminating the "what should I do now?" questions which waste everybody's time; scientific rather than spontaneous employee selection will guide prospective employees into displaying fitness or unfitness for the job, and it must be realized that the principal source of job satisfaction comes not from "fringe" benefits such as social and recreational activities, insurance, and so on, but from regular responsibilities, regular hours, and an opportunity to become proficient in an orderly and friendly atmosphere. In this way turnover, overtime, and all the other managerial headaches can be greatly decreased.

Induction Training for a Good Start. Orientation must not be confused with instruction on a job; the transition from job candidate to worker is an important step. Information and initiation are the roots of this process. Ways of handling employee orientation are described, and the necessity for adequate supervisory training is emphasized.

Low-Temperature Meat Roasting. Unless a restaurant is a fish specialty house, meat is probably the most demanded—and most expensive—item on the menu. Operators know that meat is the largest expenditure of the food dollar and the item bringing the smallest return. However, cooking losses can be averted and palatability increased by low-temperature cooking of all meats. A table is given showing proper temperatures for rare, medium, and well-done beef, and six publications are recommended as an additional help.

Sparkling Silver. "Silverware talks" is the theme of this article. Since it is so expressive, it's important that it "says" the right thing. Pre-soaking, high-temperature rinse water containing a wetting agent, and silver placed in racks "business end up" for washing are ways to speed and intensify the cleaning process.

Cleanser Selection. Detergent fundamentals from the scientific viewpoint are enumerated. Principles and properties of detergency are analyzed both for themselves and with regard to possible complications in the local water situation, such as the "hardness" of water in the Middle West.

Steam for Flavor. Steam cooking and its advantages are discussed here. Steaming not only produces full-flavored foods, but also improves color and texture, lowers costs, and makes available more time and labor for other kitchen tasks. Illustrating the article are photographs of meat; potatoes; and fresh, frozen, and canned vegetables being steamed. Foods that lend themselves well to steaming are listed. A sample steam chart provides figures on suggested lengths of time to steam foods and corresponding blank space where particular cooking times adapted to the facilities of an individual institution may be inserted if the suggested times are unsuitable.

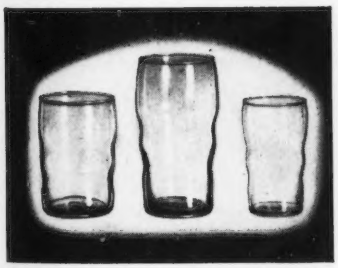
THE MODERN HOSPITAL

Vol. 78, February, 1952

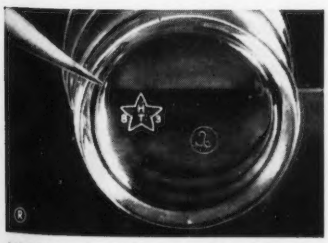
* Causes and cures of employe problems. A. M. Macfarlane.—p. 110.

Employee Problems. Training programs are not just fanciful theories—they are the foundation of all hospital food units that are outstanding in production and service. Well-trained dietary employees are the surest means of reducing costs and avoiding losses that come from dissatisfaction and bad morale in the hospital kitchen. Suggestions for a forceful training program discussed here include: employee meetings and conferences, audio-visual aids, role-playing and case methods, good induction, and specific training in hospitality, sanitation, and safety and accident prevention.

TO COMFORT THE PATIENT...
Cool beverages in a light-weight glass that's extra strong



3 double-bulge Heat-Treated tumblers offer a sure grip, even when wet: 9½ oz. (water), 12 oz. (iced tea), 5 oz. (juice).



All Libbey Heat-Treated tumblers have this special "H-T" marking—your assurance of 3-5 times longer-lasting glassware.

Nothing comforts a trembling, feverish patient more than the sight of a cool, refreshing beverage. It is even more comforting if the beverage is in a light-weight tumbler that is easy to grip.

All Libbey Heat-Treated tumblers have light-weight, thin sides and bottoms—give a cool, smooth feel that contributes much to the patient's sense of well-being. And at *no* sacrifice in strength and durability!... because Libbey Heat-Treated tumblers are specially processed after molding to stand up 3-5 times longer than ordinary tumblers in heavy hospital duty.

All Libbey Safedge tumblers have chip-resistant rims . . . at the spot where most tumblers chip first! *Safedge* means "safety" for staff and patients. It also means savings through lower cost, less breakage, smaller needed inventory . . . protected by the famous guarantee: "*A new glass if the rim of a Libbey 'Safedge' glass ever chips!*" Ask your supplier for samples and prices, or write direct to Libbey Glass, Toledo 1, Ohio.

LIBBEY GLASS
ESTABLISHED 1818

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Libbey HEAT-TREATED

Qualities of supervisors are stressed and a seven-point "things-to-do" summary concludes the article. This summary stresses the use of older and handicapped workers wherever possible and technologic advancements to release workers for more skilled jobs.

PERSONNEL JOURNAL

Vol. 30, February, 1952

* Effective performance rating. D. R. Howe.—p. 328.

Effective Performance Rating. Rating plans are useful both for administrative purposes and in helping individual workers. However, too many of them attempt to evaluate employees in terms of tangibles alone. This article describes the effects of rating plans in three eastern banks. Bank A used a one-page form with linear scales for eight "work" factors, scored in terms of decimals. This form was not successful for two reasons: five work factors were incorrectly given equal weight; moreover, personal likes and dislikes crept in, partially due to the fact that, in general, only one person evaluated each employee. A new form was, therefore, developed which employs the graphic scale, man-to-man rating, and "forced distribution." Banks B and C, also formerly dissatisfied with their plans, adopted modified forms of this procedure. Parts of the form which include definition of terms are shown.

When one employee is trying to do the work of two—when everybody is doing his best to pinch-hit for somebody else—the best solution is to put Steam-Chef on your kitchen staff! This fast-working cooker takes the squeeze off your labor situation. A steamer is always ready to go. With no waiting for water to boil, you get top speed food preparation in a hurry.

Not only that—a Steam-Chef saves the time otherwise used for scouring small pots and pans—nothing scorches in a steamer. Besides, your food is BETTER cooked, more nutritious, more tasty, nicer appearing.

In addition to cooking vegetables, meats, fowl, desserts, and other items, you can also use your steamer for warming, preheating and freshing various food. Serve foods fresh from the cooker, in small quantities or large. Steaming provides flexibility. Find out *now* what Steam-Chef standard steamers (or Steamcraft Junior models) can do for YOUR kitchen! Write for Bulletins.

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Steam Craft standard steamers are made in sizes from 2 to 4 compartments. Steamcraft Junior models are made in 1 or 2 compartment sizes, for counter or table use or mounted on their own bases. Any of these steamers is furnished for direct steam line, or for any kind of gas. Full details from your supply house or us.

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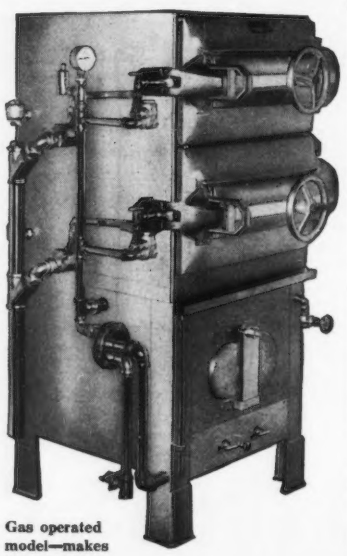

Gas operated model—makes its own steam.

PRACTICAL HOME ECONOMICS

Vol. 30, January, 1952

* Teaching foods and nutrition to adults. Part I. A modified resource unit. V. Leslie.—p. 29.

Vol. 30, February, 1952

Look, Ma, I'm cooking. H. M. Hunt.—p. 78.

* Teaching foods and nutrition to adults. Part II. A modified resource unit. V. Leslie.—p. 82.

Teaching Foods and Nutrition to Adults. Money alone, the author emphasizes, will not insure an adequate diet, although a minimum income is necessary. World War II exposed the nutritionally underprivileged condition of youth in "the best fed nation on earth." Concerted drives by governmental and other agencies have since made the U. S. nutrition-conscious to some extent. Modern homemakers, eager to plan adequate meals, must not let high prices, busy schedules, and family habits and prejudices divert them. The author describes her classes in food and nutrition, stating her beliefs with regard to responsibility, listing the program's over-all objectives, and giving an outline of procedure and suggested activities. A list of fifty-eight references of books, bulletins and pamphlets, and audio-visual aids conclude the article.

Teaching Foods and Nutrition. Suggested activities and a "check list" for evaluating effectiveness of the modified resource unit comprise the second part of this series. Meal preparation, serving, table appointments and decorations, and special occasions are discussed.

RESTAURANT MANAGEMENT

Vol. 70, February, 1952

* Modern miracles with turkey. P. P. Logan.—p. 44.
* How efficient are your waitresses? N. H. Comish.—p. 58.

Cold-weather snacks for supper service. M. L. Casteen.—p. 60.

Miracles with Turkey. Turkey, America's favorite bird, was food for Indians long before a white man reached the western hemisphere. However, turkey as we know it today did not get its start until 1800. Imported and domesticated European turkeys, descendants of those shipped to Europe from America in 1498, were crossed with our native wild ones. In the last thirty years, interest in turkey as an everyday dish has increased, and the flocks have risen from 3 million in 1920 to 44 million in 1950. Modern refrigeration and distribution is closely linked with the change in turkey from an occasional luxury to an everyday dish. Breeding is another phase which has improved considerably in the last fifteen years. Preparation of turkey, varieties, grades, and things to look for when purchasing are discussed. Also in the article are: factors determining quality; figuring a yield from one bird with ways to increase the yield; and storage.

Efficient Waitresses. Oregon was recently surveyed for the efficiency of its waitresses by thirty-five students at the University of Oregon, testing eleven different kinds of eating places. Waitresses' performances were analyzed for: approach to customer, knowledge of menu, sales ability, effective service, and personal appearance.

WHAT'S THE DIFFERENCE between these two glasses?
Black light shows only ONE IS TRULY CLEAN!
Glass washed with ordinary compound
SUPER SOILAXED Glass

Unretouched Photos. Ultra-violet equipment and technical assistance, courtesy General Electric Company.

Proof that the SUPER SOILAXED GLASS is the SANITARY GLASS!

YOUR EYES may fool you, but "black light" tells the truth!

Here, you see two glasses, both of which seem to be spotlessly clean. But, look what the invisible rays of black light reveal! Spots, stains, smears come to life with a fluorescent glow all over one glass. The other glass remains spotless. It's washed with Super Soilax!

No doubt about it, Super Soilax *really sanitizes* dishes, glasses, silver . . . makes them actually as clean as they look. 1) *Because*—its chemical action is *more* powerful . . . sweeps away *all* food soil, grease, coffee stains, lipstick. 2) *Because*—Super Soilax *forms no precipitates of its own* to dull dishes, cloud glasses, spot silver!

Get the details about Super Soilax and Super Soilax Service. Write for your copy of "Dishwashing Dividends." It's Free!

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Also manufacturers of TETROX for manual dishwashing, and PAN DANDY—new, activated pot and pan washing compound.

FIRST IN FOOD UTENSIL SANITATION!

Remember the Service Behind the Product!

News Notes

International Dietetic Congress. Eleven A.D.A. members, as this goes to press, have made tentative arrangements to attend the International Dietetic Congress to be held July 7 through 11 in The Hague, Holland. Several have been invited to speak. Dr. Margaret A. Ohlson, A.D.A. President, will be the official representative of the Association. Other members planning to travel to Europe this summer are urged to share in the unique experience of attending the first meeting of dietitians from around the globe. Registration blanks may be obtained from the national office by writing the Executive Secretary.

FAO News. The Sixth Session of the Food and Agriculture Organization Conference ended in Rome, December 6, 1951. Delegations from sixty-four countries learned the discouraging fact that despite the efforts of FAO and other organizations since World War II, world food production has increased only 9 per cent over prewar figures, whereas world population has increased 13 per cent. The Conference agreed on a target for increased world agricultural production of at least 1 to 2 per cent over the rate of population increase. While many governments felt that this figure was too low—not enough to provide an adequate diet for everyone—the majority decided that this was all that could be reasonably expected. Member governments are pledged to set up and put into action plans and programs for agricultural development to achieve their part in the world goal.

Other topics on the agenda included consideration of extension services as a means of increasing production. This recognition was particularly pleasing to the U.S. delegation, for it has long tried to promote the use of extension work in other countries as a means of getting information on improved agricultural techniques to farmers. Previously delegates from other countries have understood neither our concept of extension work nor its importance.

CARE World Health Program. CARE, Inc., has begun a new world health program at the request of the World Health Organization. This program will serve as a channel for meeting acute medical needs in critical health areas through specific CARE packages or projects for which the public will be asked to contribute financially. An "Iron Lung Bank" in Asia will be the initial project, with a goal of $60,000 to furnish ten respirators for each of three hospital centers in the East. All appeals will be based on WHO requests. Other projects being considered are: layette packages for immigrant mothers in Israel; midwifery kits for WHO training schools in India and Southeast Asia; and beds and bedding for overseas hospitals lacking them.

Journal of Clinical Nutrition. Announcement has been made of the forthcoming publication of a new international bimonthly to be called *The Journal of Clinical Nutrition*. It will be devoted to "the practical application of the newer knowledge of nutrition" and will feature original papers, review articles, and an integrated abstract section. S. O. Waife, M.D., will be the Editor. Included on the editorial board will be Grace A. Goldsmith, M.D., New Orleans; M. M. Wintrobe, M.D., Salt Lake City; Michael G. Wohl, M.D., Philadelphia; and John B. Youmans, M.D., Nashville. The roster of the Advisory Board includes: Paul György, M.D.; Pauline Beery Mack, Ph.D.; and I. S. Ravdin, M.D. Further information may be obtained by writing the editor at 133 South 36th Street, Philadelphia 4.

Dr. Rose to Be Honored. On May 23, Dr. William C. Rose, University of Illinois, will be awarded the Willard Gibbs Medal by the Chicago Section of the American Chemical Society. This award, established in 1910, is one of the highest honors in American chemistry. Dr. Rose, who worked under Lafayette B. Mendel at Yale early in his career, is noted for his work in determining the amino acid requirements of man and for his discovery, identification, and isolation of threonine. Previous recipients of this medal have included Marie Curie, Harold C. Urey, and Irving Langmuir.

Summer Workshops and Courses. *Michigan State College* will offer two workshops this summer—one in purchasing and cost control, the other in public communication techniques of foods and nutrition. The first will be held from July 14 to 25 and will be planned to help administrative dietitians, residence hall managers, and others concerned with quantity food service. The three credits which can be earned will be applicable in satisfying membership requirements in A.D.A. The second workshop, concerned with communication techniques, will include the adaptation of basic skills of foods and nutrition to communication of ideas by means of journalism, radio, and television.

From July 7 to 18, the School of Home Economics, *The Pennsylvania State College*, will conduct a workshop in applied nutrition. It will serve as a refresher course for people in community nutrition and applied nutrition work. College credit may be earned, or persons may enroll for no credit.

Massachusetts Institute of Technology will conduct its annual summer program in food technology from June 16 through July 3. This course is planned to enable those in the food industry to study recent developments in food manufacture and control, and for advanced engineering and chemistry students who may desire to investigate opportunities in the field. Among subjects discussed will be: food origin and composition; food processing; handling, transportation, storage, and control; and related chemical, microbiologic, and engineering factors.

Syracuse University and the *Bureau of Nutrition, New York State Department of Health*, are co-sponsoring the Sixth Community Nutrition Institute, to be held at the University June 16 through 28. The curriculum will be planned to help public health physicians, nutritionists, public health nurses, social workers, dentists, clinical dietitians, teachers of nutrition, public health educators, and other interested professional personnel. The Institute will include such topics as: the importance of nutrition in public health programs dealing with chronic disease and the place of the school lunch, foster home, day care center, and nursing home in stimulating better food patterns. Three hours of college credit will be given for the course.

Fellowships. Michigan State College is now offering seven predoctoral and one postdoctoral fellowship. Predoctoral fellowships range in value from $800 to $1200; the postdoctoral is worth $3000. Both are open to qualified candidates in any field of research for which the college has appropriate facilities. Inquiries should be addressed to the Dean, School of Graduate Studies, Michigan State College, East Lansing.

Plentiful Foods. The U.S.D.A. lists the following foods as those which will be in plentiful supply during April:

Protein foods	
Cheese, cottage	Fish, frozen
Chickens—broilers and fryers	Milk, nonfat dry solids
Eggs	Peanut butter
Fruits	
Dates, domestic	Oranges—fresh and processed
Grapefruit—fresh and processed	Prunes
Other foods	
Almonds	Salad oils
Lard	Shortening, vegetable
Pecans	

Army Food Course Reactivated. In October 1951 the former two-week Hospital Mess Administration Course was reactivated as a four-week course, and the name was changed to "Hospital Food Service Administration Course." This course, directed by Capt. Elsie K. Miller, includes classes in procurement of food supplies and equipment; financial management; inspection of meat, poul-

Chef-of-the-month Domenic Schiarizzi says:

"You're Sure of Excellent Cooking with WEAR-EVER ALUMINUM"

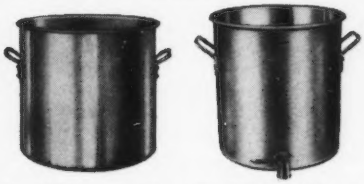
You'll find Wear-Ever Aluminum Utensils assure perfect cooking *every time.* That's because aluminum spreads heat quickly and evenly and gives perfect fidelity to recipes. Foods always cook uniformly. And "friendly-to-foods" aluminum safeguards natural tastes and flavors.

Wear-Ever utensils are made of an extra-hard, extra-tough aluminum alloy. This unusually strong alloy withstands denting and gouging—gives extra years of service—cuts replacement costs. And Wear-Ever equipment stays new-looking—remains an asset to your kitchen. Remember, *only* Wear-Ever uses extra-hard aluminum alloy for *all* utensils. See your supply house representative or mail coupon below for details.

Chef-of-the-month—He's Domenic Schiarizzi, Executive Chef of the Sheraton Plaza in Boston, famous throughout New England for its wonderful cuisine. Chefs, dieticians and cooks everywhere prefer Wear-Ever Aluminum cooking utensils.

IN TWO STYLES

Any of the Wear-Ever Professional Stock Pot sizes listed below can be furnished with faucets and strainers at extra cost.



No. 4303....3 gals. No. 4307½..7½ gals.
No. 4305....5 gals. No. 4310....10 gals.
No. 4306....6 gals. No. 4315....15 gals.
No. 4320...20 gals.

Utensil-of-the-month—It's the new Wear-Ever Aluminum Professional Stock Pot. Stamped from an individual sheet of extra-hard, extra-tough aluminum alloy. Sides and bottoms are of uniform thickness. Utensil has new-type, sanitary open bead for easy cleaning. Available in seven sizes from 3 gallons to 20 gallons.

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TITLE.....

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try, and dairy products; sanitation; and personnel utilization and implementation of the new organization of the Food Service Division. It is given at the Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston.

Government Publications. *Educational Exhibits—How to Prepare and Use Them* by H. W. Gilbertson has been released as U.S.D.A. Agriculture Handbook No. 32. Suggestions are given for attention- and interest-getting devices, materials, arrangements, appearance as to lighting and color, and captions or title signs. Techniques and types of presentations are discussed and illustrated, with ideas for exhibits in the community. Many photographs supplement the text. The booklet is obtainable from the Government Printing Office, Washington, D. C., for 25 cents a copy.

"Bread Formulas Containing 6 and 10 Percent Milk Solids" is a four-page leaflet issued by the Bureau of Human Nutrition and Home Economics, U.S.D.A., as PA-185 (superseding PA-106). Five formulas are given for: white bread, raisin bread, whole wheat white bread, white bread with soy, and white bread with soy and wheat germ. Yields range from 170 to 220 lb. per 100 lb. flour. The formulas use unenriched flour and enrichment wafers rather than enriched flour, since bakers' flour is commonly unenriched and the wafers are more convenient for meeting enrichment standards.

How to make your Blodgett do DOUBLE DUTY
BAKES HERE
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Keep this Two-in-One Kitchen Tool busy and it will pay you double dividends. It is scientifically engineered to handle all baking and roasting operations. Sections are separately fired and controlled to supply the exact temperatures for each type of food. While one deck turns out quality controlled baked goods, another deck roasts your meats at LOW TEMPERATURE, retaining the juices, lessening meat shrinkage. Hot breads and pies etc. are done when your roasts are, ready to serve oven-fresh, thus coordinating meal-production.
Blodgett makes ovens from its "Basic Three" design which provides the units to make 24 models.
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Old *Journals* Available. Many A.D.A. members either keep their copies of the JOURNAL or bind them for future reference. Occasionally a single issue may be lost, thus preventing the maintenance of a complete file. However, this situation may be remedied, for a limited number of copies of most back issues of the JOURNAL, beginning with Volume 1, Number 1, may still be purchased. Prices range from $1.50 each for issues of the first seven volumes and volume 13; $1 an issue for volumes 8 through 12; 60 cents an issue for volumes 14 and 15; 50 cents an issue for volumes 16 through 23; and 75 cents an issue for copies published since 1948.

Army Interns Graduate. Brooke Army Hospital, Fort Sam Houston, Texas, held graduation exercises September 28 for fourteen dietetic interns, all second lieutenants in the WMSC Reserve. The graduates are: Willa Jane Alie; Mary L. Blundell; Dorothy L. Boland; Mary E. Cotter; Louise G. Drozdiak; Doris M. Fredrickson; Ruth E. Kabeiseman; Josephine King; Julia J. Kula; Eleanor Love; Ermenia L. Nesci; Patricia Parker; Helen M. Gallagher Proffitt; and Ruth E. Saunders.

Pasteurization of Liquid Whole Egg. Effective pasteurization of liquid whole egg has been developed through research by the Poultry Branch, Production and Marketing Administration, U.S.D.A. The new method employs the type of equipment ordinarily used for pasteurizing milk, with little change in the set-up. Research work done on this process has revealed the heretofore unknown correct time and temperature for heating liquid egg to insure a complete kill of Salmonella bacteria without adversely affecting the commercial usefulness of the product.

News of State Associations

Arkansas Dietetic Association. May 5 and 6 are the dates for the annual meeting of the Arkansas Dietetic Association to be held with the Arkansas Hospital Association in Hot Springs.

In January, the Arkansas Association conducted an essay contest for high school seniors as a vocational guidance project. The topic of the essay was "Why I Want to Be a Dietitian." The prize for the winner was an all-expense week-end in Little Rock as a guest of the Association, during which she would visit the leading hotels and restaurants, see dietitians at work, and attend shows or other entertainment.

Christina Doyle Spear, President, Arkansas Dietetic Association, represented the state group at a meeting on "Women's Part in Civil Defense" in Little Rock on February 18.

Hawaii Dietetic Association. Highlights of two recent meetings of the Hawaii Dietetic Association have been a lecture by Sir Edward Mellanby of England who spoke on his research in vitamins and a discussion of experience with

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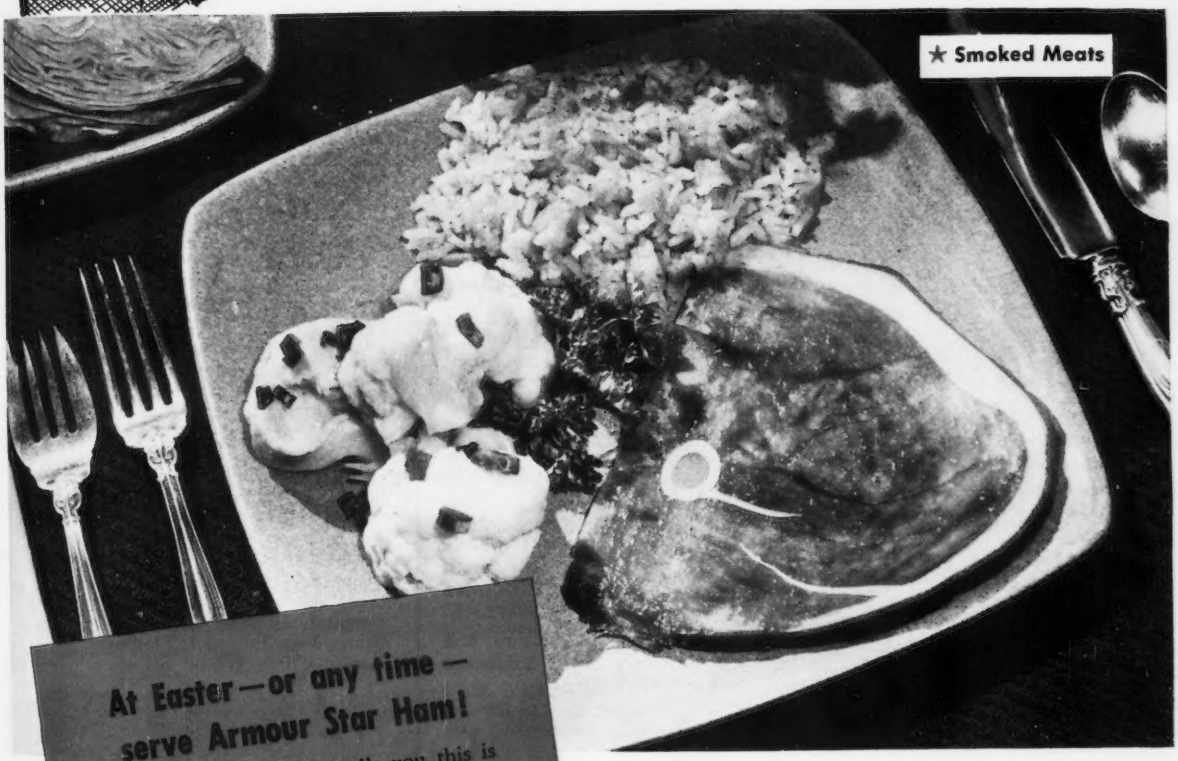
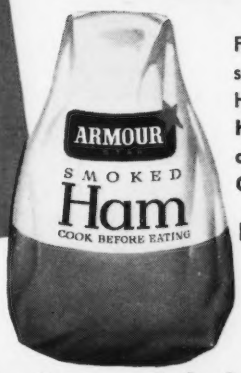


At Easter—or any time—serve Armour Star Ham!

The Armour Star label tells you this is the finest ham you can serve, and your delighted diners will agree. Each ham is carefully selected from thousands for top quality. It's sugar-cured and smoked over hardwood fires. There's no waste. Every slice of Armour Star Smoked Ham is pink and tender, thoroughly delicious.



For better meals always, ask your Armour salesman for these other fine Armour Star Hams: **Skinless, Boneless and Fatted Ham . . . Canned Ham (Pullman-style or Pear-shaped) . . . Ready-to-Eat Cooked Ham . . . Boneless Cooked Ham.**

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The best and nothing but the best is labeled ARMOUR STAR

allergic patients and their diets by Marian Conrad of Sacramento.

Illinois Dietetic Association. "Today Poses Problems for the Dietitian" was the theme of the annual meeting of the Illinois Dietetic Association held in Chicago, February 28 and 29. At the first session, Dr. Thelma Porter, University of Chicago, discussed "Current Trends in Nutrition." In the afternoon, a symposium on administrative problems was conducted. First speaker was Ray Brown, Administrator, University of Chicago Clinics, who presented the administrator's viewpoint as it concerned dietary management in the hospital. A panel discussion followed, during which the new central service system at Michael Reese Hospital, Chicago, was described by Charlotte Ludwig; cost accounting was covered by Beulah Hunzicker, Presbyterian Hospital, Chicago; and problems of feeding the aged were pointed out by Sophia Heend, Orthodox Jewish Home for the Aged, Chicago. The panel was followed by a slide show on equipment, layout, and flow of work by Mary deGarmo Bryan.

The second day's program included a morning session on professional education, for which Dr. Margaret A. Ohlson delivered a talk on "Continuing Education for the Dietitian." An exhibitors' luncheon featured a speech by Harriet Bruce Moore, Social Research, Inc., on "Psychological Facts and Dietary Fancies." In the afternoon, the dietitians heard a program on nutrition and diet therapy, which included:

"An Evaluation of Weight Reduction Diets" by Harley E. Cluxton, Jr., M.D., Northwestern University

"Some Practical Medical Problems in Dietetics" by Oglesby Paul, M.D., Presbyterian Hospital, Chicago

"Recent Developments in the Dietary Treatment of Disease of the Gastrointestinal Tract" by George H. Berryman, M.D., Abbott Laboratories

The *Chicago Dietetic Association* met on February 20 to hear Mortimer Zimmerman, Personnel Director, Passavant Hospital, Chicago, discuss "Appraising Employee Training Programs."

Michigan Dietetic Association. The Professional Education Section of the Michigan Dietetic Association is administering a $120 gift scholarship to be granted at the spring meeting, April 18 and 19, in East Lansing. The scholarship is being offered to encourage graduating seniors in home economics in Michigan colleges to intern in an A.D.A.-approved internship.

The *Detroit Dietetic Association's* September meeting featured Randolph Harrell, pharmaceutical chemist, who spoke on protein hydrolysates. It was announced at this meeting that the Detroit Public Library acknowledged the receipt of $50 for books on nutrition. The November meeting was held jointly with the Home Economics Federation of Greater Detroit, of which the Association is a member. Frances G. Sanderson, Chairman, Department of Home Economics, Wayne University, spoke on the work simplification program in which she has pioneered with the Michigan Heart Association. Phyllis Winterton, Derby Technical College, England, discussed the home economics program at her college. Officers of the *Detroit Dietetic Association* are: President, Sarah Jencks, Evangelical Deaconess Hospital; President-Elect, M. Elizabeth Vaughn, Visiting Nurses Association; Vice-President, Annie Lou Wertz, Henry Ford Hospital; Secretary, Bernita Youngs, Grace Hospital; and Treasurer, Neva Keene, Wilbur Wright School.

Minnesota Dietetic Association. The Minnesota Dietetic Association, cosponsored with the Minnesota Home Economics Association the annual Career Days Workshop held April 3 through 5 on the University of Minnesota campus.

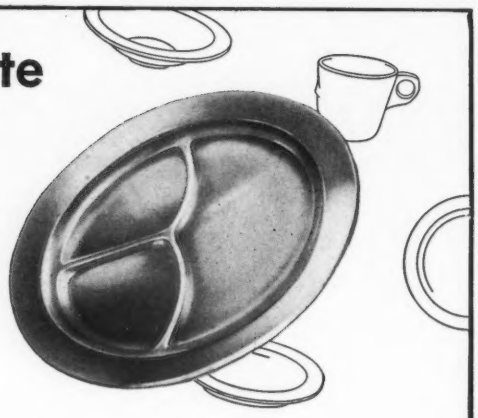
Dietitians employed in state institutions met in St. Paul, January 15 and 16, for a special meeting on food cost accounting. A workshop was conducted by Rosalind C. Lifquist, Bureau of Human Nutrition and Home Economics, U.S.D.A. A second meeting was held with Mary deGarmo Bryan as leader.

New York State Dietetic Association. The New York State Dietetic Association will hold its annual meeting April 24 and 25 in Rochester. The program will include the following speeches:

"The Spotlight Is on You"—Dr. Charlotte M. Young, School of Nutrition, Cornell University, Ithaca

"Getting the Job Done through Visuals"

A Complete Line . . . without a Break



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POWDER BLUE
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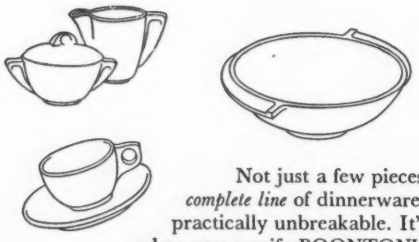

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Twenty-three items right now, and more to come. Every piece a fashioning of Melmac® at its finest in style, weight, and durability. And seven handsome colors to consider in building or accenting your decorations.

When you make the all-important dinnerware decision, choose *a complete line.* Go all the way with BOONTONWARE, the Melmac line that has a piece for every food service need.

See your regular Supply House or write to us for the name of your nearest Dealer.

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Boontonware complies with CS 173–50, the heavy-duty melamine dinnerware specification as developed by the trade and issued by U. S. Department of Commerce, and conforms with the simplified practice recommendations of the American Hospital Association.

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Thousands and thousands of restaurants, hotels, and clubs all over America serve Chase & Sanborn Fancy Mark Coffee—and have been serving it for years! Yes, it's far and away the most preferred coffee in its field . . . many times ahead of its nearest competitor!

And restaurant and hotel managers who want to serve iced tea at its best prefer to use Tender Leaf Iced Tea Bags.

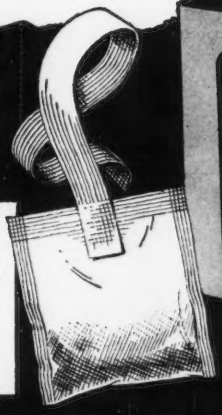
You can increase the popularity of your food service by using these two companion products: Chase & Sanborn Fancy Mark Coffee and Tender Leaf Tea. Both are famous for building customer satisfaction that boosts restaurant profits!

INSTITUTIONAL DIVISION STANDARD BRANDS INCORPORATED

For information on these and the many other famous Standard Brands products for Hotels, Restaurants and Institutions, write to Institutional Division, Standard Brands Incorporated, 595 Madison Avenue, New York 22, N. Y.

Perfect for ICED TEA!

- Full-flavored! Flavor stands up in the ice-filled glass!
- Economical! Profitable! A little makes a lot!
- Easy to use! You can make a gallon as easily as a glassful!



Put up in 1 oz. bags . . . just right for quantity production

Tender Leaf ICED TEA BAGS

BRAND

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H.B.C. WELSH RAREBIT

. . . and so easy, too!

● Here's the "Special Treat" main dish at the *low-budget* cost you've been looking for—*delicious* H. B. C. Welsh Rarebit!

Nothing to add—simply heat and serve as it comes from the can or use in many easy variations—Spaghetti Loaf, Rice with Cheese, Potatoes au Gratin, etc.,—16 kitchen-tested quantity recipes suggested in our free 8-page folder!

May also be used pound for pound as cheese ingredient in any recipe—saving much work and cost! H.B.C. Welsh Rarebit eliminates the mess most chefs dislike. At the same time the cost is less than your purchase cost of the same ingredients would be!

2-year aged Cheddar cheese is used exclusively in making H.B.C. Welsh Rarebit. Cooked at a carefully controlled temperature, all lumps and rubberiness common to many rarebits is eliminated.

Delight your diners and reward your budget with this low cost treat for Friday and many other meals. *Free recipe folder on request.* Send for a trial order today!

Case of 24 8½ oz. cans ..... **case $ 7.95**
Case of 12 3 lb. 3 oz. cans ..... **case $22.35**

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DIETETIC SCALE

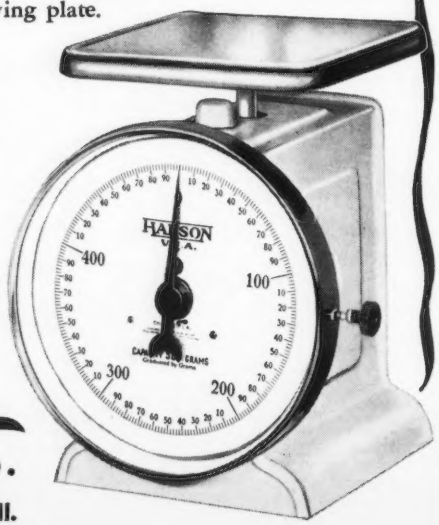
The standard diet scale of the medical profession for controlled diets. Rotating dial eliminates computation as each item of food is added on the serving plate.

Capacity 500 grams by grams. Stainless steel platform, white enamel body, easy to keep clean.

Model 1411 (illustrated) has glass protected dial, price $15.00

Model 1440 enamel dial, price $10.00

See your Supply House



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—Adrian TerLouw, Eastman Kodak Company, Rochester

"Proteins, Amino Acids, and Hormones in Relation to ACTH and Cortisone" —Dr. E. Henry Keutmann, Rochester

Also included in the program will be a panel on quality foods, a symposium on weight control, a demonstration of flower arrangements, and a joint banquet with the New York State Home Economics Association.

Ohio Dietetic Association. Akron will be host to the Ohio Dietetic Association during its annual convention, April 25 and 26. "Enlarging Our World" will be the theme of the meeting. Among the speakers will be Dr. Josef Brozek, University of Minnesota, who will discuss "Studies in Starvation and Rehabilitation."

The *Cleveland Dietetic Association* at its February meeting heard Dr. Elroy Stromberg, Western Reserve University, speak on "Human Relations in a Dietary Department." The Association is also cooperating with the Cleveland Heart Society in an effort to standardize the low-sodium and low-cholesterol diets used in local hospitals.

Members of the *Dayton Dietetic Association*, at their March meeting, received advice on how to be hard to delude in business transactions. Hazel Nolan, President, Ohio Better Business Bureau, gave the talk titled "I'm No Sucker."

Association Activities

Our Representatives. April brings us news of many state dietetic association meetings with national representatives attending:

April 17–19—Beulah Hunzicker, Texas Dietetic Association, Fort Worth (this is a change in date)
April 18–19—LeVelle Wood, Michigan Dietetic Association, East Lansing
April 23—Cora E. Kusner, Connecticut Dietetic Association, New Haven
April 24–25—Ruth M. Yakel, Virginias-Carolinas dietetic associations, Roanoke
April 25—Margaret C. Bernard, New Mexico Dietetic Association, Albuquerque
April 25–26—LeVelle Wood, Alabama Dietetic Association, Tuscaloosa
April 26—Cora E. Kusner, Maine Dietetic Association, Augusta

A.D.A. and Civil Defense. Dr. Lillian S. Coover has accepted the appointment to serve as Civil Defense Chairman of the Association. She will appreciate receiving any civil defense information from state associations—addressed to her at 2121 Hughes Avenue, Ames, Iowa. Dr. Coover is also the official A.D.A. representative to Women's Activities in Civil Defense, a national civil defense committee. She attended a regional civil defense meeting in Chicago on February 22.

Look Ahead—The Future Is Bright. The new A.D.A. publication, "Look Ahead—The Future Is Bright," has just been released. Designed to replace "Double Feature" as an attraction for

COOKING WITH CARNATION

LESSON No. 4

Why does Carnation Evaporated Milk make better Cream Pie Filling?

Carnation is good whole milk with over half the water—and *only* water—removed. So it is concentrated to *double-richness.* Even when you mix Carnation with an equal amount of water, it's richer than state standards for bottled milk. Furthermore, Carnation is specially *heat-refined* for easier, smoother blending with the other cooking ingredients. Carnation's extra richness, plus this heat-refining, give cream pie filling a creamier, smoother texture and richer, more delicious flavor. Results you just can't get with ordinary bottled milk!

What Ingredients are used in Carnation Cream Pie Filling?

Filling Ingredients	8-inch baked Pie Shell	9-inch baked Pie Shell
Sugar	⅓ cup	½ cup
Cornstarch	2 tablespoons	3 tablespoons
Salt	½ teaspoon	½ teaspoon
Carnation	1 cup	1⅓ cups
Water	1 cup	1 cup
Egg Yolks	2	3
Vanilla	½ teaspoon	1 teaspoon
Meringue Ingredients	**8-inch Pie**	**9-inch Pie**
Egg Whites	2	3
Sugar	¼ cup	⅓ cup
Browning Temperature	350° F.	350° F.
Browning Time	8-10 minutes	12-15 minutes

How is Carnation Cream Filling Prepared?

1. Combine the dry ingredients with the Carnation-water mixture over hot water. Cook 12 to 15 minutes. Stir occasionally; add small amount custard to egg yolks. Mix and return over hot water.

2. Cook filling 3 to 4 minutes; pour into *cooled* pie shell. Beat egg whites until they are frothy; add sugar and beat until stiff. Place on cooled filling. Brown for time and temperature indicated.

3. Serve Carnation Cream Pie with hot coffee. It's a family favorite, and perfect as a special party dessert. For variety fill six individual pastry shells instead of a 9-inch pie shell.

How else is Carnation used?

Where *any* recipe says milk, use Carnation mixed with an equal amount of water. For "creaming" coffee, cereals and most cream purposes, use it *un*diluted.

For reprint of this lesson write Carnation Company, Dept. C-42, Los Angeles 36, California

NO OTHER FORM OF MILK HAS SO MANY USES AS

Carnation EVAPORATED MILK

"From Contented Cows"

Army Announcements Concerning Dietetic Personnel

The following dietitians have received initial appointments in the Women's Medical Specialist Corps Reserve and are on active military duty:

Capt. Alma Wainwright Thom, R-21
1st Lt. Julia A. Neale, R-20201
2nd Lt. Edith R. Morris, R-2633
2nd Lt. Jane R. Probert, R-20055

The following dietitians are now on active military duty:

Capt. Lelia H. Roark, R-1136
1st Lt. Marjorie A. Pabst, R-2433

The following dietitians have been promoted: Maj. to Temporary Col., Nell Wickliffe, R-10036; 1st Lt., to Temporary Capt., Helen M. Bjerke, R-246; and 2nd Lt. to Temporary 1st Lt., Betty J. Wolfe, R-1235.

The following dietitians have received appointments in the Regular Army:

Second Lieutenants

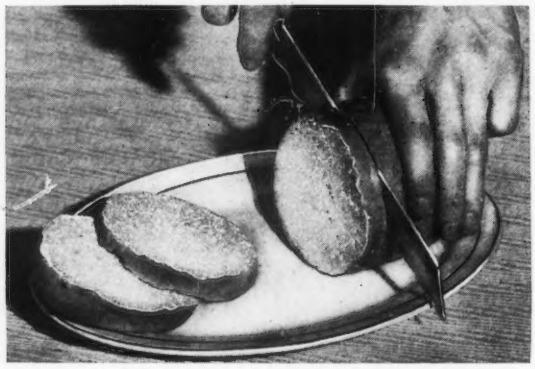
Barbara Priceman Apter, R-10138
Eileen B. Witte, R-10144

Listed below are dietitians who have been separated from service:

Capt. Anna T. DeNegri, R-10082
Capt. Merle M. Hall, R-10013
Capt. Althea L. Luttrell, R-10051
Capt. Nevella H. Snyder, R-10020
1st Lt. Chartley M. Morley, R-1432
1st Lt. Nancy O. Rowan, R-2497
1st Lt. Marilynne E. Savage, R-2558
1st Lt. Corinne Seago, R-2436
1st Lt. Natalie M. Shackleford, R-1263
1st Lt. Martha E. Smith, R-2562
1st Lt. Ann W. Watson, R-2563
1st Lt. Ouida Weimer, R-10099
1st Lt. Eileen Patricia Welch, R-2423
2nd Lt. Helen M. Proffitt, R-2587

For The
LOW-SALT
DIET

ACCEPTED COUNCIL ON FOODS AND NUTRITION AMERICAN MEDICAL ASSOCIATION



CELLU Salt-Free WHITE BREAD
Tasty and Nourishing—Convenient to Use

For the cardiac patient, and others whose sodium intake must be limited. CELLU WHITE BREAD is a yeast bread, prepared without salt or milk. Baked in tins and sealed as soon as it leaves the oven, to protect freshness and flavor.

CELLU
SOYAMAISE
(Salt-Free)

A tangy salad dressing for fresh and cooked vegetables made without added salt. Sodium content 0.036%. Be sure to specify *Salt-Free* Soyamaise

● *SEND FOR PAMPHLET ON CELLU Low-Salt FOODS*

PURPOSEFULLY PREPARED
CELLU *Dietary Foods*
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the junior and senior high school groups, its up-to-the-minute eight pages convey the story of dietetics in pictures and streamlined text. It also serves as an introduction to *Dietetics as a Profession.* You will want to see that every junior and senior high school student in your state receives a copy. It is ideal for give-away literature at Career Days. Orders should be sent directly to the headquarters office. Prices are:

Single copy	$ .10
50 copies	4.00
100 copies	6.00
200 copies	10.00
500 copies	20.00

Dietitians in Demand. Having been subjected to a radical face-lifting, "Dietitians in Demand" is now available again. This new edition is graced with new color, new photographs, and revised text.

Photo Contest. Last year's photo contest yielded such a splendid crop of pictures that another will be conducted this spring. It opens April 15 and closes June 15. Members of the Association and the general public are urged to participate. See page 346 for the official rules.

New Exhibits. Some of the prize photographs from last year's contest are finding their way into new exhibits, which will replace the familiar three-panel exhibit. A number of the pictures are being mounted individually, and others are being grouped. These photographic exhibits are planned for the use by state and local dietetic associations. Those interested in ordering any of this material are asked to indicate the subject matter desired; for example, scenes illustrating the duties of the administrative dietitian.

A.D.A. President in Limelight. The *International Altrusan* carried a feature on Dr. Margaret A. Ohlson in March.

History. Prior to official Association meetings held in February in Chicago, Dr. E. Neige Todhunter, Chairman of the History of Nutrition and Dietetics Committee of A.D.A., and Dr. Lillian S. Coover sorted literature of historical value from the collections of Lulu G. Graves and M. Faith McAuley in the Association office.

News of Advertisers

A new scale for use in clubs, clinics, hospitals, doctors' offices, and so on has been added to the *Hanson Scale Company's* line. Called "Weigh-Master Model No. 700," the 8-in. dial is elevated 32 in. above the floor for easy reading. The scale has a capacity of 300 lb., a platform 13 by 12 in., and requires only 15½ by 12 in. of floor space.

Edward Don & Company has acquired the Perlman Supply Company, for seventy-five years makers of glassware and china.

THE TRUTH ABOUT FROZEN ORANGE JUICE

Significant Dietary Advantages Of Fresh-Frozen Minute Maid Orange Juice Over Home-Squeezed Orange Juice Shown By Independent Research

RECENT assays[1] emphasize the nutritional superiority of reconstituted Minute Maid Fresh-Frozen Orange Juice over home-squeezed orange juice in three important respects:

a. Average levels of natural ascorbic acid were significantly *higher* in Minute Maid;

b. Peel oil content was significantly *lower* in Minute Maid;

c. Bacterial counts were dramatically *lower* in Minute Maid.

Two chief reasons for Minute Maid's higher ascorbic acid content are advanced by qualified technical experts:

First, oranges vary widely in ascorbic acid content due to differences in varieties, rootstocks, and exposure to sunshine during ripening.[2] Thus, whole oranges, squeezed a few at a time in the home, provide a highly erratic source of Vitamin C. Yet because this vitamin is not well-stored in the body, optimum nutrition makes desirable a uniformly high intake. Each can of Minute Maid, however, represents the pooling of juice from hundreds of thousands of oranges; thus wide variations in nutrients from orange to orange tend to be eliminated.

Second, because it is frozen, Minute Maid loses none of its ascorbic acid content during the time lag between producer and consumer.[3] Whole fruit, however, is subjected to variations in temperature, and care in handling cannot be maintained throughout the journey from tree to table. Controlled laboratory tests have shown an average ascorbic acid loss of 10.7% in whole oranges after 11 days under simulated storage and shipping conditions.

Peel oil, previously shown to cause allergic response and poor tolerance, especially in infants,[4] is held to an arbitrary minimum in Minute Maid. Samples of home-squeezed juice expressed by typical housewives showed peel oil contents up to 700% higher than Minute Maid.

Bacterial counts were found to be as high as 350,000 per ml. in home-squeezed samples—but were uniformly low in Minute Maid. Technicians ascribe this to the combination of rigid sanitary controls in the Minute Maid process and the low pH and low temperatures at which the juice is kept. In the case of home-squeezed juice, high bacterial counts are doubtless due to contamination from the exterior peel which is unknowingly added to the juice during preparation.

In view of the above findings, more and more physicians now specify Minute Maid Fresh-Frozen Orange Juice in lieu of home-squeezed orange juice where optimum year-around intake of natural Vitamin C is indicated.

REFERENCES

(1) *Rakieten, M. L.*, et al., *Journal of the American Dietetic Association, October, 1951.*

(2) *U. S. Department of Agriculture Technical Bulletin No. 753, December, 1940.*

(3) *Roy, W. R., and Russell, H. E., Food Industries, Vol. 20, pp. 1764-1765 (1948).*

(4) *Joslin, C. L., and Bradley, J. E., Journal of Pediatrics, Vol. 39, No. 3, pp. 325-329 (1951).*

Reprints of Reference Material Mailed on Request

MINUTE MAID CORPORATION, 488 Madison Ave., New York 22, N. Y.

Wallace R. Roy, Ph.D., Director of Research

A.M.A. HANDBOOK of NUTRITION

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An up-to-date symposium by 30 authorities. Includes nutritive requirements under war stresses seldom studied before. New or completely rewritten chapters cover nutritional needs in geriatrics, illness and disease; dietary interrelationships and imbalance; caloric undernourishment and starvation; important new information on individual nutrients, and effective substitution of nutrients without significant tissue injury.
Discusses foods and their nutritional qualities. Presents latest findings on protein, fat and carbohydrate metabolism. Classic demarcation lines of nutrient metabolism are shown to be meaningless. Neatly bound, well-indexed, with an extensive bibliography.

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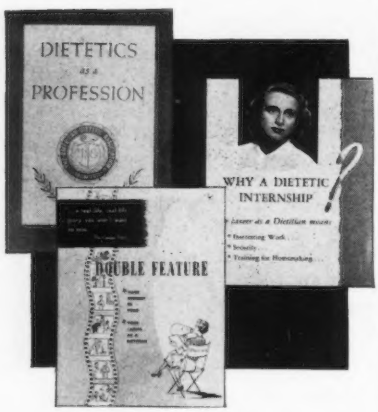

Dietetics as a Profession gives detailed information concerning the qualifications and opportunities for dietitians. Price 25 cents.

Why a Dietetic Internship? explains the importance of a year's internship and describes the activities of a dietetic intern. Price 5 cents; in lots of 25—$.75.

Double Feature was written specifically for the high school girl, and describes simply, with the aid of clever illustrations, the various opportunities offered in a dietetic career. Single copy free; in lots of 100—$1.50

Send your order and remittance to:

THE AMERICAN DIETETIC ASSOCIATION
620 North Michigan Ave. Chicago 11, Illinois

New Appointments, Veterans Administration

The following hospital appointments of dietitians, not previously announced, have been made by the Veterans Administration.

Name	Position	Location
	Boston Area	
William O. Allen	Staff Dietitian	Castle Point, N. Y.
Marbeth Bell	Staff Dietitian	Montrose, N. Y.
Helen Bride	Staff Dietitian	Togus, Me.
Rubye L. Grambsch (Reappointment)	Staff Dietitian	Castle Point, N. Y.
Suzanne M. Larkin	Staff Dietitian	Montrose, N. Y.
Shirley M. Sunderland	Staff Dietitian	Albany, N. Y.
	Washington, D. C. Area	
Charlotte Bartels	Staff Dietitian	Martinsburg, W. Va.
Shirley K. Boldt (Reappointment)	Clinic Dietitian	Louisville, Ky., RO Cl.
Winnie L. Bryant	Staff Dietitian	Lexington, Ky.
Santa Elba Cancel	Staff Dietitian	San Juan, P.R.
Carolyn A. Dammann	Staff Dietitian	Perry Point, Md.
Helen B. Dandelot	Clinic Dietitian	Huntington, W. Va., RO Cl.
Paquita Haddock	Staff Dietitian	Martinsburg, W. Va.
Ida A. Herman	Staff Dietitian	Perry Point, Md.
Esther B. Hess	Staff Dietitian	Indianapolis, Ind.
Mildred G. Klahn (Reappointment)	Staff Dietitian	Ft. Benjamin Harrison, Ind.
Jane S. McKinney	Staff Dietitian	Indianapolis, Ind.
Florence J. Meiers	Staff Dietitian	Lexington, Ky.
Mildred C. Murdock	Staff Dietitian	Roanoke, Va.
Virginia M. Naughton (Reappointment)	Staff Dietitian	Ft. Howard, Md.
Genevieve H. Olkiewicz	Staff Dietitian	Ft. Wayne, Ind.
Clara A. Perrini	Staff Dietitian	Lyons, N. J.
Ana Maria Rivera	Staff Dietitian	Kecoughtan, Va.
Marjorie I. Taylor	Staff Dietitian	Butler, Pa.
Ellanora M. Valle	Head Dietitian	Indianapolis, Ind.
	Atlanta Area	
Cora Alexander	Staff Dietitian	Tuscaloosa, Ala.
Julianne E. Hillman	Staff Dietitian	Jackson, Miss.
Guthrie C. Jackson	Staff Dietitian	Tuskegee, Ala.
Annie F. Kennedy	Staff Dietitian	Nashville, Tenn.
Georgia Morgan	Staff Dietitian	Tuskegee, Ala.
Mary Frances Rotolo	Staff Dietitian	Coral Gables, Fla.
Birdie Warren	Staff Dietitian	Lake City, Fla.
	St. Louis Area	
Carolyn D. Carlson	Staff Dietitian	Wichita, Kans.
Helen M. Hille	Staff Dietitian	Waco, Tex.
Helen L. Kessner	Head Dietitian	Poplar Bluff, Mo.
Jean M. Malsch	Staff Dietitian	Alexandria, La
Joyce Newcomb (Reappointment)	Staff Dietitian	Shreveport, La.
Jean A. Robinson	Staff Dietitian	Topeka, Kans.
Cissy T. Shigetomi	Staff Dietitian	Ft. Lyon, Colo.
Elizabeth A. Wetzel	Staff Dietitian	Springfield, Mo.
Ramona Zauner	Staff Dietitian	Houston, Tex.
	Ft. Snelling-St. Paul (Minnesota) Area	
Marianne Anderson (Reappointment)	Staff Dietitian	Hines, Ill.
Paquita Arroyo	Staff Dietitian	Downey, Ill.
Mary O. Brakel	Research Dietitian	Hines, Ill.
Jeanne F. Ciciora (Reappointment)	Staff Dietitian	Hines, Ill.
Thama Cook	Staff Dietitian	Downey, Ill.
Jean Eskedal	Staff Dietitian	Minneapolis, Minn.
Aileen Havsgaard	Staff Dietitian	Sioux Falls, S. Dak.
Theresa Hunsaker	Staff Dietitian	Downey, Ill.
Beverly J. Jasper	Staff Dietitian	Tomah, Wis.
Beryl G. Meyer (Reappointment)	Staff Dietitian	Sioux Falls, S. Dak.
Vivian Meyer	Staff Dietitian	Wood, Wis.
Jane Anne Nolan	Staff Dietitian	Cheyenne, Wyo.
Frances H. O'Brien (Rein.)	Staff Dietitian	Minneapolis, Minn.
Edna L. Paz-Sanchez	Staff Dietitian	Downey, Ill.
Rosa Sanchez	Staff Dietitian	Minot, N. Dak.
Betty Jane Smith	Staff Dietitian	Downey, Ill.
Florence A. Smith (Reappointment)	Staff Dietitian	Hines, Ill.
Mary Ellen Wadden	Staff Dietitian	Wood, Wis